Implementation Evaluation Report

NOAA-21stCCLC Watershed STEM Education Partnership – Pilot Program

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Executive Summary: NOAA-21stCCLC Implementation Evaluation

In a pilot program, the result of an interagency partnership between the U.S. Department of Education's 21st Century Community Learning Centers (21stCCLC) program and the National Oceanic and Atmospheric Administration (NOAA), watershed education organizations (Watershed grantees) across the country partnered with local 21stCCLC sites to provide STEM-based programming, focused on their local watershed, to youth in after-school or summer programs. Seventeen grantees developed and delivered projects in 2017.

An implementation evaluation was conducted to provide feedback to the partner agencies about the level of quality, strengths, and challenges that emerged during the first year of enacting these local partnerships and projects. The study used multiple methods, including systematic observations of implementation at six diverse projects (n=18 observations) and semi-structured interviews with leaders at Watershed and 21stCCLC partners (n=9). Observation data were assessed using the Dimensions of Success (DoS) rubric, to measure quality in informal STEM education, as well as a newly developed rubric to assess indicators of quality against the essential elements of the Meaningful Watershed Educational Experience (MWEE) framework.

Use of Educational Best Practices

Pilot projects showed success at implementing quality educational programming across multiple measures. Using the DoS rubric, projects showed compelling evidence of five (of 12) dimensions and reasonable evidence for another four dimensions. Scores were mostly on par with national averages, although the Watershed projects excelled at demonstrating Relevance, with scores 0.69 points higher than the national average.

Using the MWEE rubric, projects similarly excelled at framing issues and activities with a high degree of local relevance (Local Context), approaching activities to emphasize connections with students' lives, choices, and communities. The field experiences and background activities tied to a single, locally-relevant driving issue of the MWEE. This suggested a positive relationship between the DoS and MWEE best practices, in which the MWEE framework was well-suited to ensuring STEM education is deeply contextualized and relevant.

The DoS dimensions that were relatively more challenging were Youth Voice, Reflection, and STEM Content Learning. However, the latter two scores were almost identical to national averages, suggesting score ranges were typical. Youth Voice showed the greatest room for improvement; this dimension reflects youth opportunities to shape the direction of activities and, potentially, share learning outside of the group. In parallel, two of the more challenging attributes in the MWEE framework also looked at student reflection and outward-facing action – Synthesis and Stewardship Action Projects. This parallel indicates that improvements in these MWEE elements could also positively impact Youth Voice scores.

Strengths in Implementation

In addition to high levels of quality documented in observational data, educator interviews identified a wide range of strengths in process and outcomes within projects. Educators' reflections mirrored some of the observational data about day-of instruction: nearly all leaders commented on the high level of student enthusiasm for the Watershed education experiences, particularly the field experiences. There were also comments about the strong, positive rapport that Watershed educators built with youth at the 21stCCLC sites.

Project staff also experienced strengths in planning and partnership-building between the Watershed organization and 21stCCLC, although all felt that more time would have enabled greater impact. Most projects felt they had effective communication and buy-in from local 21stCCLC leaders. In addition, a couple of projects found unanticipated success when Watershed educators co-taught with 21stCCLC staff and/or learned from their experience. Administratively, a major strength was that grantees felt supported and understood expectations from the funder, particularly via their interactions with the National Marine Sanctuary Foundation.

Project leaders also felt that they had observed evidence of a range of student learning outcomes, including gains in knowledge about watershed concepts, attitude changes, and students taking pro-environmental actions, based on their project experiences. In addition, leaders observed other outcomes that were less directly tied to STEM content, which included students benefiting from access and exposure to new places, and having a positive impact on youth self-esteem.

Challenges in Implementation

When discussing challenges in implementation, the rapid timeline was most often mentioned as an issue. Each project commented on this factor, and it was often linked as a complicating factor when discussing other challenges experienced, such as setting and clarifying expectations, getting sufficient enrollment, and finding opportunities to integrate Watershed projects with the core 21stCCLC curriculum and activities. In particular, projects felt they would have benefited from having more time at the planning and project development stage.

Another overarching theme was that projects experienced challenges in adapting a Watershed education curriculum originally designed for K-12 school-day implementation to be used in out-of-school (after-school or summer) settings. The change in setting introduced differences in the context of instruction that were not always anticipated. Watershed educators faced different challenges than in K-12 classrooms, including fluctuating attendance, students having a "summer mindset," and that the Watershed curriculum was not supported by intervening instruction or guided reflection by a classroom teacher. This indicated that there may be a slight learning curve in crafting curriculum for after-school settings for Watershed grantees who are new to working in this environment.

Another emergent theme within the challenges experienced was that some project leaders noted a lack of curriculum integration and planned opportunities for expertise sharing between the Watershed and 21stCCLC partners. These comments reflected a sense of potential in making Watershed projects more than "add-ons" to the 21stCCLC day. Expertise sharing emerged incidentally in several projects, most often around classroom management and disciplinary systems, where Watershed educators needed to learn the 21stCCLC's methods. In other cases, 21stCCLC educators took on a stronger role in extending or contributing to the Watershed curriculum, often in unplanned ways. This approach did not expect 21stCCLC staff to become expert STEM educators, but enabled them to bring their expertise and approaches to enhance opportunities for student reflection and meaning-making. Those projects that dabbled in this type of expertise sharing found it beneficial for themselves and for the student experience.

Implications & Future Directions

- NOAA's bottom-up approach to the pilot projects – in which local groups design projects based on local expertise and partnerships – showed great promise to create STEM learning experiences that are highly relevant and engaging for youth. By leveraging local, place-based resources and designing curriculum around an issue relevant to the local watershed, educators connect to students' personal experiences while exposing them to new experiences within their community.

- Essential to this type of bottom-up, locally-developed model is having sufficient time for planning and relationship-building among local partners. The limited timeline in the pilot was a cross-cutting challenge reported by projects. It proved difficult to collaborate extensively, with the sense that having more time in the planning phase to work with the 21stCCLC would ensure the most impactful program.

- To maximize the potential impact of expertise sharing and curriculum integration between partners, future RFPs and supporting resources could recommend or require that projects intentionally include plans to engage in these types of collaborative experiences, reframing the nature of the relationship between the Watershed and 21stCCLC organizations.

- Watershed organizations may need further support to increase their understanding of the characteristics of after-school settings and how projects for this setting might differ from curriculum or activities in K-12 classrooms. It may be helpful to deemphasize "adaptation" of curricula, and focus on applying the most impactful parts of traditional MWEEs in new ways, honed for after-school settings.

- Although there was success at demonstrating educational best practices in the pilot projects, potential areas for improvement could be supported with further PD or training opportunities for grantees. The DoS framework, in particular, may be less familiar to Watershed educators. Discussing and demonstrating how the DoS principles are applied as a facilitator (not just in planning), and their relationship with familiar MWEE best practices, may be beneficial for improving future project implementation.

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Introduction

Project Background

For the past several years, the U.S. Department of Education's (ED) 21st Century Community Learning Centers (21stCCLC) program has led interagency partnerships, collaborating with federal agencies to bring hands-on STEM education to out-of-school time programming for high-need students. In 2017, ED established a partnership with the National Oceanic and Atmospheric Administration (NOAA) for a pilot program – the NOAA-21stCCLC Watershed STEM Education Program.

In the pilot, NOAA supported watershed education organizations (Watershed grantees) to partner with 21stCCLC sites to provide STEM-based programming, focused on the watershed, to youth in after-school or summer programs. Applicants were drawn from past grant recipients and major partners in the NOAA Bay Watershed Education and Training (B-WET) program, as this prior experience was an indicator of capacity to rapidly implement STEM-based environmental education utilizing NOAA science. These grantees were able to modify existing watershed education materials, activities, training for an after-school setting in a way that emphasized STEM skills, engaged students and staff in hands-on environmental education (outdoors and indoors), promoted student interest in STEM careers, and met 21stCCLC sites' student learning and staff capacity-building needs.

In addition, the Watershed grantees were selected to represent the full geographic diversity of U.S. watersheds, by including grantees from each of the seven B-WET regions. Within the B-WET program, the regional structure allows support for capacity-building and responsiveness to local education and environmental priorities. The seven B-WET watershed regions are: California, Chesapeake Bay, Great Lakes, Gulf of Mexico, Hawai'i, New England, and the Pacific Northwest.

In total, 17 Watershed grantees received funds to establish projects with local 21stCCLC sites, in which they would deliver programming for youth and, in most cases, provide professional development sessions for 21stCCLC site staff. The National Marine Sanctuary Foundation (the Foundation) supported implementation as the manager of the awards and serving as the main point-of-contact for Watershed grantees. In addition, the national 21stCCLC program provided support and resources through the organization You for Youth (Y4Y).

A Glossary of Terminology Used throughout this Report

NOAA-21stCCLC Program: The national pilot program; a partnership of NOAA and ED, with implementation support by the Foundation and Y4Y

21stCCLC: In this report, this acronym identifies the organization, staff, provider, etc. of the after-school/summer site with whom a Watershed grantee partnered to provide project activities

    Partner: the organization-level or the 21stCCLC site that provides after-school programming

    Educator/Staff/Leader: an individual who leads day-to-day after-school programming, instruction

    Curriculum: the standard, typical experiences and instruction of the 21stCCLC (outside of the Watershed project)

Project or Watershed Project: One of the local STEM/watershed education projects funded through the pilot program, implemented locally by grantees

Watershed: The (capitalized) descriptor identifies the organization, staff, curriculum, activities, etc. of the watershed education organization who was the main recipient and organizer of a Watershed Project

    Grantee/Partner: the organization-level of the grantee, provider of watershed education

    Educator/Staff/Leader: the individuals involved in designing, running, and implementing projects

    Curriculum: the designed sequence of watershed education sessions and activities specifically for this project

Educational Best Practices

This NOAA-ED partnership provided an opportunity to bring together two established frameworks of educational best practices – one for informal STEM education (Dimensions of Success) and one for watershed education (Meaningful Watershed Educational Experiences). To understand the programming and the evaluation of the NOAA-21stCCLC pilot, it is important to contextualize project activities within the details of these two frameworks, which were intended to guide project development. Further, these two frameworks anchored much of the data gathering and analysis in this study.

Dimensions of Success

The Dimensions of Success (DoS) framework was established and validated by the PEAR Institute (Shah et al., 2014) as part of an effort to develop an observational assessment tool for measuring evidence of best practices in informal STEM education. The DoS framework articulates 12 dimensions of informal STEM education best practices in facilitator-led settings, such as after-school programs. The framework is tailored to planning and evaluating programs at the day-to-day activity level, while using aggregated data from multiple sessions to make inferences at a project level, as it is not expected that each dimension may be emphasized in every session.

The 12 dimensions are organized into four overarching domains (see box, below). One domain focuses on suitability of the learning environment; another looks at youth engagement in purposeful activities; the third examines practice and development of STEM understanding; the last looks at positive youth development characteristics.

Dimensions of Success Framework

FEATURES OF THE LEARNING ENVIRONMENT

Organization: preparation, availability of materials, sequencing, flexibility, transitions

Materials: appropriate, appealing, and aligned with learning goals

Space Utilization: conducive to informal learning, distractions minimized

ACTIVITY ENGAGEMENT

Participation: youth participate in all aspects equally, following directions

Purposeful Activities: activities and time spent are related to STEM learning goals

Engagement with STEM: hands-on activities to explore STEM where youth do the cognitive work

STEM KNOWLEDGE & PRACTICES

STEM Content Learning: accuracy of content presented and evidence of youth learning

Inquiry: youth use authentic practices of scientists, mathematicians, engineers

Reflection: opportunities for youth to reflect and engage in meaning-making about activities

YOUTH DEVELOPMENT IN STEM

Relationships: positive, respectful youth-youth and youth-facilitator interactions

Relevance: explicit connections made between activities and real-world or everyday lives

Youth Voice: youth ideas are heard, they make meaningful choices, share ideas outside program

Meaningful Watershed Educational Experiences

Over many years of development, NOAA B-WET has articulated a framework of educational best practices in watershed education that support the creation of Meaningful Watershed Educational Experiences (MWEEs). NOAA defines a MWEE as:

Multi-stage activities that include learning both outdoors and in the classroom, and aim to increase the environmental literacy of all participants.

(See NOAA website for full MWEE definition.)

The established best practices for MWEEs are grounded in research on effectiveness in environmental education. The framework consists of 19 elements, within three broad categories:

- **1: MWEEs for Students:** characteristics of activities and student involvement
- **2: Support for MWEEs with Students:** characteristics and resources that form the context for student activities
- **3: Teacher Professional Development (PD) for MWEEs:** characteristics of PD that builds capacity to enact effective MWEEs

As these categories suggest, the MWEE framework is tailored to planning at a curriculum level, rather than day-to-day activities. For the purpose of this study, we focused on the elements of MWEE best practices that were most germane to an implementation evaluation looking at student experience. This included all best practices within "MWEEs for Students" (Issue Definition, Field Activities, Stewardship Projects, and Synthesis), as well as two of the best practices within "Support for MWEEs with Students" (Use of Local Context and NOAA Assets). The summarized definitions of these six elements are described in the box, below. A full description of the framework for best practices in creating MWEEs is available from NOAA.

Several connections are clear when these definitions are examined next to those of the DoS framework. For instance, characteristics of strong Outdoor Field Activities likely include DoS characteristics of Purposeful Activities, Engagement with STEM, and Inquiry. Strong work in Synthesis & Conclusions likely aligns with DoS indicators for Inquiry, Reflection, and Youth Voice. However, because MWEE practices more directly align with the watershed education principles that guide the work of B-WET and the Watershed grantees, it was important to consider both frameworks in an implementation evaluation, side-by-side, to present a well-rounded, relevant picture to stakeholders.

MWEE Essential Elements: A Best Practices Framework

ISSUE DEFINITION & BACKGROUND RESEARCH (1.1)
Students focus on an environmental question, problem, or issue requiring investigation. They learn about the issue through instruction, data collection, talking to experts, and other methods.

OUTDOOR FIELD ACTIVITIES (1.2)
Students participate in multiple outdoor field activities to collect data or make observations to answer research questions, inform action, and/or support issue definition. Students should be actively involved in planning and conducting.

STEWARDSHIP ACTION PROJECTS (1.3)
Students participate in an age-appropriate project to take action to address environmental issues at personal or societal levels. Activities could include restoration, everyday choices, community engagement, or civic action.

SYNTHESIS & CONCLUSIONS (1.4)
Students analyze and evaluate results of projects and investigations. They synthesize and communicate conclusions to external audiences, such as the school, parents, or the community.

USE OF LOCAL CONTEXT FOR LEARNING (2.3)
The local environment is a primary resource for a MWEE. Place-based education is rooted in the unique aspects of a community, offering the opportunity to explore how individual and collective decisions impact students' surroundings.

INCLUDES NOAA ASSETS (2.5)
The MWEE makes use of the wealth of applicable products, services, and scientific experts available from NOAA that can heighten impact. This includes environmental professionals' ability to serve as role models for career choices and stewardship.

Evaluation Goals

For the pilot year, evaluation of the NOAA-21stCCLC program focused on examining implementation of projects within the pilot, providing feedback to the partnering agencies about the quality, strengths, and challenges that emerged during the first year of enacting these local partnerships and projects. The study was guided by three overarching questions:

- To what extent do pilot projects demonstrate STEM education and MWEE best practices, in terms of instruction and student participation?

- What, if any, patterns and relationships emerge between strength of best practices and other implementation characteristics?

- What project-level challenges are experienced? How might program-level strategies be modified to address them in the future?

Project Site Selection: The Sample

The evaluation looked at implementation at six of 17 project sites. A form of purposeful sampling, maximum variation sampling, was used for its ability to gather data that highlights the breadth of variation in a program and, from that, look for evidence of patterns within that wide variation (Patton, 1987). The criteria used to ensure maximum variation included:

- Project Type: After-school or Summer
- Geographic: B-WET Regions
- Community Setting: Rural, Urban, or Suburban
- NOAA National Marine Sanctuary proximity

The final sample included three after-school and three summer projects; projects from five B-WET regions; one rural, two urban, and three suburban; and two with stated proximity to National Marine Sanctuaries. NOAA and the Foundation approved final selections based on their knowledge of individual projects and verified this sample would represent wide variation from the population of projects. Table 1, below, shows the profile of characteristics of each of the six projects sampled.

Table 1. NOAA-21stCCLC Pilot Implementation: Key Characteristics of Project Sites Sampled for Evaluation

Project ID[1]	Timing	B-WET Region	Community	Marine Sanctuary
Project 1	After-school	Chesapeake	Rural	No
Project 2	After-school	Chesapeake	Urban	No
Project 3	After-school	New England	Suburban[2]	Yes
Project 4	Summer	Gulf of Mexico	Suburban	Yes
Project 5	Summer	Great Lakes	Urban	No
Project 6	Summer	California	Suburban	No

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[1] Project sites have been de-identified to the extent possible in this report.

[2] Community designations here are based on community size and proximity to an urban center. In most cases, this aligned with self-reported descriptors during the grant proposal process. However, Project 3 identified as urban, but its community size and characteristics were more accurately described as suburban.

Methods

Project Observations

The primary method for this study was repeated, systematic observations of project implementation, which were examined for evidence of quality in STEM and watershed education best practices. This ethnographic approach captured a rich pool of observational data about project implementation and characteristics. The observational protocol followed the procedure established by the DoS methodology (Shah et al., 2014), in which the observer takes field notes as a continuous, written log of what students and facilitators do during activities, what they say, timing of activities, setting details, and attributes of youth. Every effort is made to ensure that field notes are an objective and detailed record of what transpires. All data were collected by PEAR-certified observers.

Observations were made at three sessions for each Watershed project, sampling sessions across phases of implementation to capture at least three of the four MWEE elements: Issue Definition, Field Activities, Synthesis, and Action Project. Because these elements sometimes occur in different sessions and in a linear timeline, sessions were also selected to be near the beginning, middle, and end of a project cycle, as possible.

DoS Analysis

The DoS methodology provides a validated rubric for analyzing quality within informal STEM education. DoS examines projects against 12 dimensions of quality (see Background). Observers review field notes and use the DoS rubric[3] to apply a numeric score to each dimension: 1=Evidence absent, 2=Inconsistent evidence, 3=Reasonable evidence, and 4=Compelling evidence. Each score is supported by a description of evidence, directly from field notes, aligned with rubric criteria. Scores across all observations (n=18) were averaged for an overall DoS profile and for comparison with national averages, provided by The PEAR Institute. Average and median scores were calculated for each project (n=3) to obtain project-level DoS profiles. Exploratory crosstab analyses examined data for trends suggesting a relationship between DoS scores and other attributes, such as class size or setting.

MWEE Analysis

Although MWEE best practices are well defined, there is not an existing observational protocol for evaluation. While extensive instrumentation was beyond the scope of this study, we took a first step to create and test a system to assess strengths and challenges from observational data.

Development of this tool had to address a few fundamental challenges of adapting MWEE essential elements (tailored to curriculum-level planning) to scoring a MWEE in practice. First, each element is multi-faceted, consisting of a suite of interrelated features. To address this, for each student experience element (1.1-1.4), we identified two characteristics; each was scored separately and summed for a final element score that reflected its multiple components. Second, MWEEs are multi-day, with different elements emphasized on different days. Due to this, the rubric did not assess a single session (as with the DoS); instead, evidence was collected across three observations and used to apply an overarching score. In some cases, further evidence about non-observed sessions was incorporated (e.g., total field experiences), but such use was limited. An early version of the rubric was reviewed by NOAA B-WET regional grant program managers, who are experts in MWEEs. From this feedback, definitions were clarified and tightened to ensure they reflected a commonly-held set of principles.

Scoring used a four-point system that mirrored the DoS levels. Each student element (1.1-1.4) had a total possible score of 8 (summed from two sub-scores); the support elements (2.3, 2.5) each had a possible score of 4. A draft scoring guide and data recording system was created at the start of the evaluation. Scores applied after completion of observations for each project, with two scorers discussing interpretation. In a few instances, rubric definitions were slightly refined to address ambiguities. With each change made to the rubric, prior data were revisited and scores were updated, if necessary. (See Appendix B for rubric.) Each project received one set of scores for its MWEE. An overall average and median were calculated for the full set of observed MWEEs (n=6).

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[3] The DoS observational rubric cannot be included in this report, due to copyright restrictions.

Staff Interviews

To supplement and aid interpretation of observational data, the evaluation included 60-minute, semi-structured interviews with representatives from Watershed grantees and 21stCCLC sites at the six projects within the study. A total of nine interviews were completed. One leader was interviewed from each of the Watershed grantees (n=6). In five instances, the interviewee had both the role of a planning partner and an educator who worked with the students; in one case, the interviewee had planned the project, but did not directly work with students; in the last case, the interviewee had worked with students, but not been involved in partnership development.

Staff from three 21stCCLC partners were also interviewed (n=3).[4] The three 21stCCLCs that were included in the interviews were sampled to include a representative from each type of setting – rural, urban, and suburban – in an effort to represent a diversity of contextual perspectives for 21st Century Community Learning Centers.

Interviews were conducted by phone, scheduled at the convenience of the participant. Conversations were semi-structured, with a guiding set of questions and topics used, but allowing the interviewer to adjust the sequence, wording, and probing follow-ups to allow for a natural conversation and exploration of emergent issues of interest to the study. Interviews focused on four main areas: 1) Overall Implementation, 2) Insights on DoS and MWEE Best Practices, 3) Impressions of Impacts, and 4) Preparation and Support.

Analysis

A primarily deductive approach was used for coding interview data for strengths and challenges experienced in implementation by project staff. Interview transcripts were initially reviewed by both evaluators, noting emergent and salient themes that were seen across interviews. These notes were shared and discussed, and the team arrived at an overarching framework that could be used to code evidence of strengths and challenges experienced by projects. This framework articulates four levels of curriculum development and implementation:

- **National-Level Support**: related to leadership and support at the national level, including funding, PD, communication, etc.
- **Project Planning & Collaboration:** related to the working relationship between the Watershed grantee and 21stCCLC, including logistics, local resources, and collaboration factors.
- **Curriculum Design:** related to the design or structure of the curriculum project; things that relate to advance work of design.
- **Curriculum Implementation:** day-of components, related to either delivery by an educator or contextual factors that affected implementation (i.e., weather or student mindset).

Within each level, interviews revealed several sub-themes representing specific strengths or challenges that were experienced within a category. For reporting, **results were examined at the project level;** for projects where both a Watershed and 21stCCLC leader were interviewed, the themes expressed are reported as a collective picture of the experience of that project. Reporting focuses on presenting the breadth of themes expressed, with attention paid to which themes were more or less commonly expressed across the six projects.

In addition, the dimensions/essential elements of the DoS and MWEE frameworks were used as deductive codes, with interview comments that reflected strengths or challenges experienced related to those elements coded accordingly, and examined in conjunction with quantitative analysis of scored observational data, and reported to help interpret the results, including gaps and "blind spots" from the observational methodology.

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[4] The interview procedure was limited to nine total interviews due to constraints placed on non-OMB-cleared data gathering.

Results

Study Project-Site Profiles

It is helpful to consider results of the study in light of the context of implementation at the six projects in the study. For an initial overview, Table 2 (below) show profiles of key implementation characteristics of the six cases in the study.

Most projects observed served middle school students; one served both middle and elementary students, while another served only elementary students. Overall student demographics by site are in Appendix A. The number of students varied widely, from three to 29. Typically, projects held 6-10 sessions; the median number of contact-hours was 14.5. Most projects held 1-2-hour sessions once per week (two projects held 1-hour prep/debrief sessions as well). Project 4 was an outlier; they completed a three-week cycle, with 3-hour sessions four days per week. This resulted in 36 hours of programming, more than double the other projects.

The number of educators from the Watershed grantee ranged from 1-3 at each session. Typically, assistants from the 21stCCLC partner were more present during outdoor sessions than indoor sessions, typically playing primarily the role of chaperone and aiding with behavior management. Although this was not always the case, which is discussed further in the results.

A key part of the MWEE framework is identifying its "Driving Issue" (Table 3). The degree of specificity of these issues, as determined from observational data and project documentation, varied quite widely. While some focused on a specific aspect of human impact (e.g., Project 2), others stated a broader, more general focus on human impact (e.g., Project 4).

Table 2. Implementation Profiles of Project Sites Studied (the portion of the project observed)

Project ID	Season	Grade Level	Number Sessions[1]	Total Contact Hours[2]	Students per Session (avg.)	B-WET Region	Community
Project 1	After-school	MS	6 + 4	15	3	Chesapeake	Rural
Project 2	After-school	MS	10	14	14	Chesapeake	Urban
Project 3	After-school	ES	9	10	11	New England	Suburban
Project 4	Summer	MS	12	36	6	Gulf of Mexico	Suburban
Project 5	Summer	ES/MS	6 + 6	18	29	Great Lakes	Urban
Project 6	Summer	MS	6	12	23	California	Suburban

[1] Shorter debrief or prep sessions, if used, are indicated after the +
[2] Program hours estimated from stated schedule and observational data, with time for travel/snack/meals not included

Table 3. Driving Issue for Project MWEE (abbreviated and deidentified)

Site ID	MWEE Driving Issue
Project 1	Exploration of fecal bacterial contamination of local waterways, its sources, detrimental health effects, and ways to prevent it from occurring.
Project 2	Exploration of marine debris – causes, sources, path, impacts; and specifically, how marine debris manifests in and relates to the local bay and outlets from the city.
Project 3	What is a watershed. Who lives in our watershed. How humans impact the watershed.
Project 4	The impact of human activity on water quality and wildlife in the local creek and bay bodies of water.
Project 5	We are part of a watershed that has a variety of water resources and habitats, we use and impact those resources and we have a responsibility to protect those resources.
Project 6	Human impact on water quality through comparison of multiple watersheds, with many issues mentioned during the observed sessions (e.g., ocean acidification, litter, nutrient pollution, sediment pollution).

Use of Best Practices in Implementation

Across the six projects in the study, DoS ratings showed great strength in Relationships, Space Utilization, Organization, Materials, and Purposeful Activities. Using the MWEE framework, they excelled at Issue Definition, Field Activities, and Use of Local Context. Areas of challenge, with the lowest overall ratings, were Youth Voice and Reflection (DoS) and Stewardship Action Project (MWEE).

Informal STEM Education Practices

Overall DoS Scores

Looking across all of the six projects and 18 observations, the average scores for each dimension of the DoS framework ranged from a high of 3.83 out of 4.0 (Relationships) to a low of 2.33 (Youth Voice). Figure 1 shows the breakdown of scores, organized into the four overarching domains of the DoS Framework. From this visual it is clear that **Watershed projects in the pilot excelled at creating strong Features of the Learning Environment (all average scores above 3.5) and were strong in the area of Activity Engagement.** Scores in the area of STEM Knowledge & Practices tended to be lower than other areas, and scores in Youth Development covered the spectrum of scores.

When these scores are examined in comparison to national averages (PEAR, 2017), we see that this profile is generally aligned with national trends (Figure 2, next page). Differences between the projects' average scores were very small l for about half of the dimensions (+/- 0.13 or less), which was considered a negligible difference in this analysis. For the other six dimensions, **four showed Watershed projects had noticeably higher scores than national averages (0.27 to 0.69 higher) – Relevance, Purposeful Activities, Relationships, and Inquiry.** There were only two areas where Watershed projects showed noticeably lower scores than the national average – Participation and Youth Voice (0.30 and 0.24 lower, respectively).

| ■ Median = 4 | ■ Median = 3 | ■ Median = 2.5 | ■ Median = 2 |

Features of Learning Environment: Organization 3.56, Materials 3.50, Space Utilization 3.61

Activity Engagement: Participation 2.89, Purposeful Activities 3.44, Engagement with STEM 3.00

STEM Knowledge & Practices: STEM Content Learning 2.61, Inquiry 3.17, Reflection 2.39

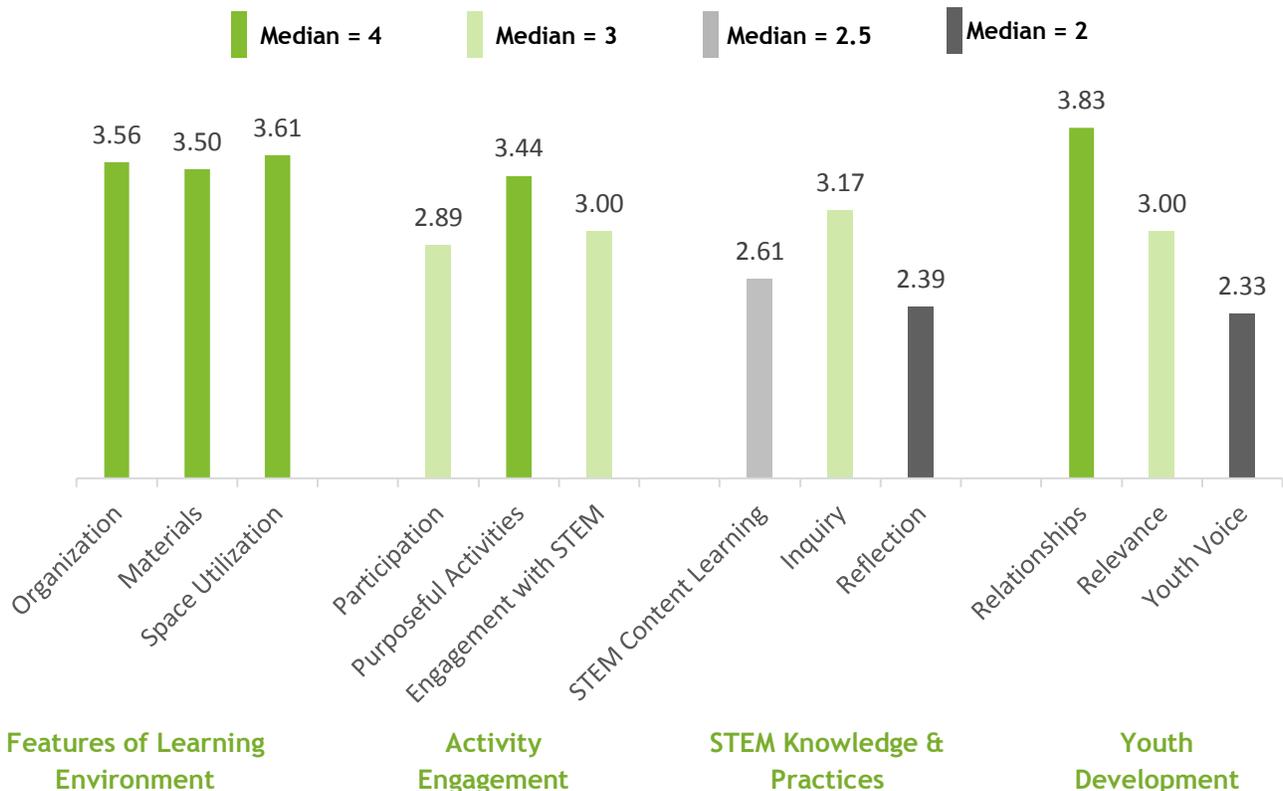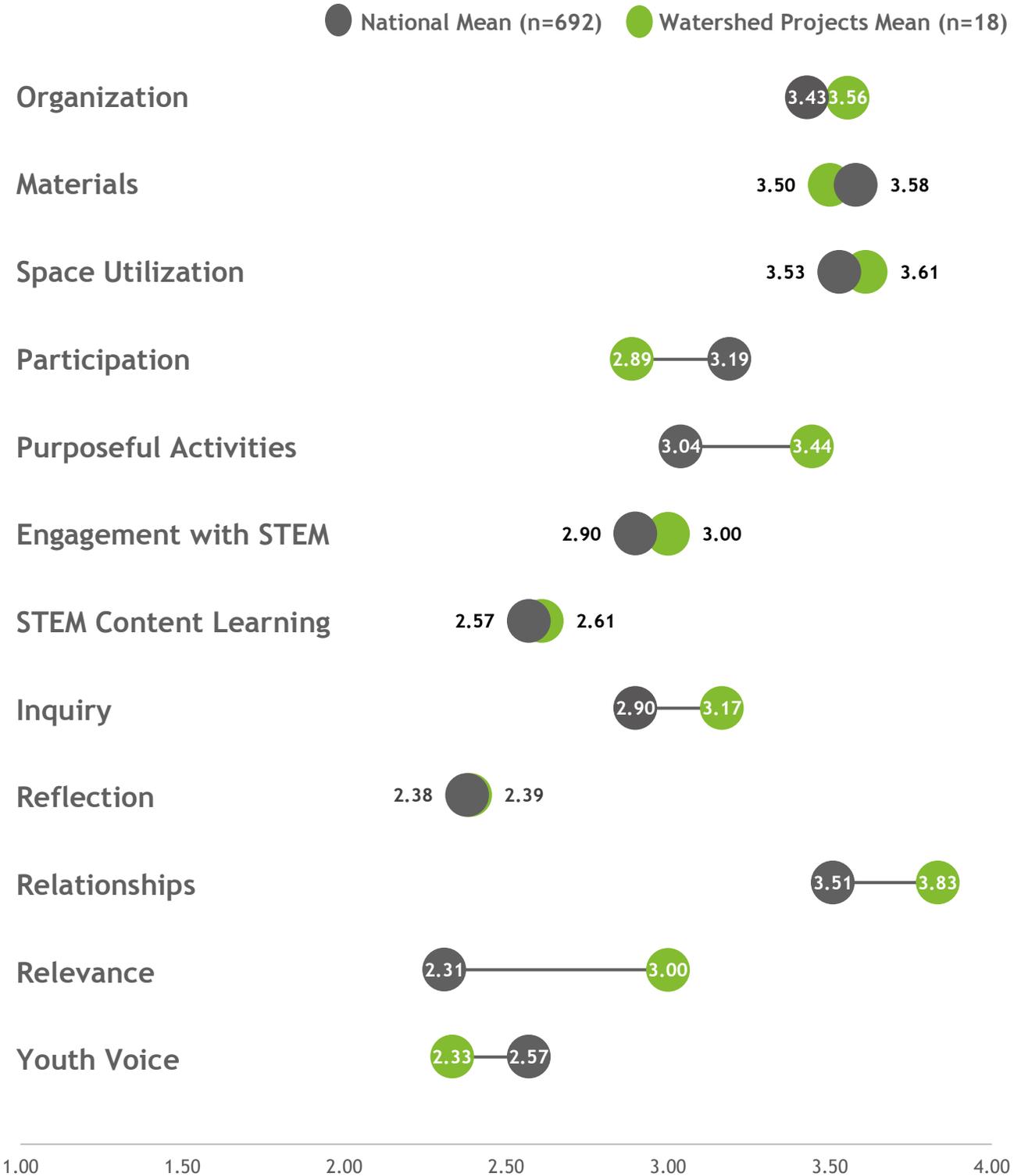Youth Development: Relationships 3.83, Relevance 3.00, Youth Voice 2.33

Figure 1. Average DoS scores across all observations (n=18), organized by category; score range is 1-4. Colors indicate median score.

Figure 2. Average DoS scores for Watershed projects and data from national DoS database

National Mean (n=692) Watershed Projects Mean (n=18)

Category	National Mean	Watershed Projects Mean
Organization	3.43	3.56
Materials	3.58	3.50
Space Utilization	3.53	3.61
Participation	3.19	2.89
Purposeful Activities	3.04	3.44
Engagement with STEM	2.90	3.00
STEM Content Learning	2.57	2.61
Inquiry	2.90	3.17
Reflection	2.38	2.39
Relationships	3.51	3.83
Relevance	2.31	3.00
Youth Voice	2.57	2.33

Figure created by authors, based on summarized data of DoS national averages provided by The PEAR Institute (2017)[5]

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[5] *All analysis, findings, interpretation, and conclusions based on DoS observational data expressed in this report are from the report authors; they do not necessarily reflect those of The PEAR Institute, Harvard Medical School, or McLean Hospital.*

Looking at the individual dimensions, separated from their categories, we can see the specific strengths and challenges of the Watershed projects overall (Table 4, right). Five of the 12 dimensions showed very strong scores across observations – with median ratings of 4 out of 4, indicating there was consistent, compelling evidence of this attribute. **Relationships, Space Utilization, Organization, Materials, and Purposeful Activities were all very strong in these projects.**

In interviews, representatives from many of the projects agreed that they felt successful at building positive relationships with youth. Both Watershed and 21stCCLC staff talked about the Watershed educators' skill at building rapport and trust with students relatively quickly. Across observation notes, there was frequently evidence of warmth and enthusiasm between students and educators.

> *"[We] were able to establish trust with both groups of kids pretty early on and …I think that's just related to [our] ability to connect with the kids. But, regardless, that is what went well, was that these kids were responsive, they grew to trust us, they were excited to go wherever we went. That trust enabled them to come along and be open to it." (Project 5, Watershed)*

In considering Organization, interviews and observation notes confirmed that Watershed educators consistently put effort into organizing materials, lesson plans, and activities prior to each session to maximize learning time. Several staff even reflected on making on-the-fly adaptations, another key part of this dimension.

> *"Everything was really well organized, and I liked how the [Watershed partner] really had everything together, and they would just bring that to us…. From our end, the setup was actually fairly easy because we would just ask and coordinate, what do you need, do you need a classroom, what can we do, and we would set it up. And then they would actually bring all the materials to us, which I thought, from our perspective, that was great." (Project 6, 21stCCLC)*

Table 4. Overall average and median ratings from 18 observations within each Dimension

	Overall Mean	Overall Median
Relationships	3.83	4
Space Utilization	3.61	4
Organization	3.56	4
Materials	3.50	4
Purposeful Activities	3.44	4
Inquiry	3.17	3
Engagement with STEM	3.00	3
Relevance	3.00	3
Participation	2.89	3
STEM Content Learning	2.61	2.5
Reflection	2.39	2
Youth Voice	2.33	2

One Watershed partner described an approach to planning which supported the strong scores in Purposeful Activities that was seen across many of the projects:

> *"We definitely want the students to have a clear objective, when they're coming in, of what they're going to be learning and have it be a focused lesson. We don't have very much time with them and so we want to maximize the time that we have with them in learning. … we started very broad and as we got further along we drilled in on a lot of smaller concepts so that we feel like, by the time they got done, they understood what a watershed was and how a watershed is connected to the bay and how all of those human impacts that we have on the watershed will alter the ecology of [the local bay]." (Project 4, Watershed)*

Four dimensions received median ratings of 3 out of 4, demonstrating consistent reasonable evidence of this attribute of success (light green rows in Table 4). **Inquiry, Engagement with STEM, Relevance, and Participation fell in this group of strengths.**

Leaders' reflections about Inquiry and Engagement with STEM were often intertwined, as their curriculum designs wove together scientific practices and hands-on use of authentic scientific tools. Many leaders saw this as a central responsibility of their work, and one (Project 1) even gave an extended description of how their curriculum was built directly on the learning strands articulated in the National Research Council report, *Learning Science in Informal Environments* (2009).

"I think the main strength with the program was you can actually go out into local environments and actually do science and see how science works, instead of just reading about it in terms of "I'm going to create this hypothesis, and then what." They are actually able to go out and do testing and see how the process works first-hand. I think that's really great." (Project 6, 21stCCLC)

"[A strength of the project was] Using models in the classroom, using maps. They loved hands on things where they can play around with models, and then taking that outside. They really get it." (Project 3, Watershed)

Relevance was another area of strength for most projects, which interviews and observations suggest may have benefited from its ties to aspects of the Local Context element of the MWEE framework. As projects developed curricula rooted in local issues, there were efforts to highlight or connect with issues of direct relevance to the lives of the students. This may help explain why the NOAA-21stCCLC projects scored a great deal higher on this dimension than the national average.

"There's a lot of places we have where you can go and see the ocean, go to a different location to hike, and it's very close by, but I think we tend to forget about it just because we get busy in our daily lives. So, I think to connect a lot of these things that [students] hear at a grander level, or a societal level or a national level to something they can actually see, observe, and test in real life, and see how some of these things like pollution are actually impacting the local environment, I think was really good for our program." (Project 6, 21stCCLC)

Only three of the 12 dimensions appeared to present some challenges for the NOAA-21stCCLC projects. **In the areas of STEM Content Learning, Reflection, and Youth Voice projects tended to show inconsistent evidence** (2 out of 4; gray rows in Table 4). None of the dimensions were consistently absent of evidence of success.

Youth Voice was probably the most challenging dimension for many projects. Observations and interviews both point to these projects having limited opportunities for youth to actively shape the direction of activities and/or to communicate to outside audiences. Most often, project leaders attributed this challenge to the short duration of the interventions. They felt that there would need to be more time or less content in a curriculum, or a rethinking of plans, in order to accommodate more opportunity for youth direction.

"I think that we could allow more flexibility in the last outreach, maybe the last field trip…, that we could around mid-program assess what students are loving and maybe they want to repeat or expand upon. So, less content to achieve, more youth voice." (Project 2, Watershed)

Regarding Reflection, some Watershed leaders felt they could have dedicated more session time to reflective discussion. However, some comments pointed to a limitation in the observational method, indicating that observed sessions may have may have under-represented Youth Voice or Reflection activities. Project 5 reported using additional post-field trip debriefing sessions for reflection (not observed). Project 2, described how the 21stCCLC partner engaged students in extension activities that targeted Youth Voice and Reflection, such as designing and creating new products (like a rap) in relation to their Watershed learning experience, also not captured in observations.

The STEM Content Learning dimension is comprised of two components – the content delivery by facilitators and evidence of students understanding or making content connections. Observational data indicates that Watershed educators were strong in content delivery, but evidence of student comprehension (beyond memorization) was sometimes hard to discern. Several interviewees did note times when they felt students struggled with concepts. One leader noted that repeated re-engagement with activities seemed to improve comprehension, rather than thinking of each session as a one-shot opportunity.

DoS Ratings by Project

Looking at ratings across the three observations for each project shows trends that mirror patterns in the overall data; but they also reveal some distinctive attributes of individual projects. Table 5 (page 13) shows the overall profile for each project, characterizing whether its scores indicated the dimension was a strength or challenge. These distinctions informed exploration of data by project attributes, later in the report.

For instance, while five projects' ratings indicated challenges with the Youth Voice dimension, Project 1 showed this dimension to be one of its great strengths. This was largely because this dimension evaluates youth role in decision-making about activities and communication outside of the group, which was rarely seen in projects – as enacted or as designed. At Project 1, however, observations showed instructors giving students options for how to proceed with their water quality study and ultimately what Action Project they would like to do; they selected sharing their findings with a city official responsible for water quality issues. This was a very strong example of Youth Voice, and the Watershed educator described in the interview how this example aligned with a larger vision for this Watershed grantee organization.

"Having student voice and choice is an emerging priority for us in our program. We've transitioned over the last couple of years to look at our existing programming and find where could we interject more of this…. It links to our mission as an organization, which is to educate and inspire people of all ages to be stewards of the earth, successful stewards of the earth, which is broad. That outcome is an engaged, active citizen. We went backwards by design. We really started looking at our programs and what ways do our programs deepen, engage citizenry, and in which ways do they inadvertently suppress it?" (Project 1, Watershed)

Another area of contrast was in the dimensions of Materials and Purposeful Activities. Nearly all projects revealed these areas to be implementation strengths; however, Project 6 observations indicated that these two dimensions were a slight challenge. Observational data indicated this was due to one classroom session where evidence was inconsistent and different than observed activities during field sessions. The classroom session involved fewer materials and had gaps in alignment between the stated goals of activities and the ways they were enacted. Both field sessions showed stronger evidence of both, indicating that improvements in implementation of the classroom session would have improved overall quality. In an interview, the Watershed leader noted that some elements of the classroom session – particularly the emphasis on adult-led, presentation-style delivery – were something they would like to improve in the future.

Similarly, the Relevance dimension was a strength for most projects, but it appeared to be a major challenge for Project 3 and a slight challenge for Project 5. At Project 3, observational data indicated that facilitators tended to mention connection with prior project activities, but there was little observed evidence of the facilitator or students verbally making connections with the students' lives, outside knowledge, or experiences. Even with the use of local environments, this type of dialogue about personal connection was not evident. For Project 5, while there were instances of facilitators making connections between activities and familiar aspects of students' lives, students' comments often didn't consistently reflect that they were making these connections. One of the strongest examples observed was during an activity of harvesting magnetite from sand, where facilitators contextualized it with the Etch-A-Sketch toy, but students engaged in little conversation around this connection.

Project 4 was also distinctive, based on these scores. While most challenges were similar to those experienced by other projects, they showed that Inquiry (or authentic STEM practices) was a slight challenge, while other projects revealed this dimension to be a strength. This score weakness was due to one observed session that did not substantially include STEM practices; it used activities related to conceptual understanding of food webs, but did not involve scientific inquiry practices. The Watershed leader confirmed this assessment during an interview. The other sessions observed – one in the field and one in the classroom – both showed reasonable evidence of Inquiry. Project 4 used a highly integrated STEAM model, in which half of each session was spent engaged in art-making practices, related to the project's themes. It is interesting to note that the additional time spent engaging in artistic practices did not cause a substantial diminishment of scores regarding the use of authentic STEM practices (measured by the Inquiry dimension); the two were well integrated and balanced.

Interestingly, Project 1 showed the strongest overall profile, with all of their dimensions showing average scores of 3.0 or higher. Based on observational and interview data, the evaluators felt that this project made strong use of several assets and resources available to their project. Based on interview data, the lead Watershed educator showed extensive background and training in pedagogy and frameworks of best practices in education – even beyond DoS and MWEE (e.g., citing alignment with National Research Council published framework). This training and experience seemed to allow the educator to demonstrate a high level of expertise in designing and supporting highly youth-centered learning, with strength in reflection and youth voice, among other attributes. Looking at all of the data, this attribute may have been the most critical to achieving the high degree of success.

Further, this was the only rural project observed, and it was evident that Project 1 was able to leverage relationships within town government in order to maximize student learning – such as arranging the opportunity for youth to present findings to town officials. While the relationships were key, it is also likely that this type of activity (which was arranged within 24 hours of students selecting it) was much more easily achieved within a small community than it would be in a major city.

Finally, Project 1's after-school session had the smallest class size of any projects observed. (Note: summer enrollment at this project was much higher.) Again, this context allowed for a high degree of one-on-one interaction between facilitators and students, access to materials, and substantial bonding among students and with facilitators. However, in the interview, the facilitator felt that the same implementation could be achieved with a larger group of students.

On the other hand, Project 6's scores suggested it experienced the greatest challenges at consistently demonstrating all of the DoS dimensions, with scores revealing more areas of challenge than strength. A pattern within all observed sessions at this project, which had very high attendance and generally only one Watershed educator per session, was student comments indicating that they struggled to grasp underlying STEM content and that there were relatively few opportunities for open-ended questioning, reflection, and meaning-making. The Watershed leader noted that more reflection occurred in an unobserved session near the end of the project; however, the 21stCCLC educator commented that the task of leading students in reflection can be quite difficult for any educator, with the suggestion that it is a skill that needs practice and experience. This educator even reflected on the potential benefit of using smaller group or one-on-one interactions to improve in the area of reflection and student meaning-making.

"I'm getting my degree in counseling, psychology [and] they always tell us to ask open-ended questions … I thought I was ready to go in with youth and ask those questions. And the first day I tried it, they answered with a simple answer. …You answered an open-ended question with, like, two words, I can't believe this. So, the age group can be very challenging in terms of reflection. I think one of the things that can be difficult about that is the influence of peers. I think it's not necessarily that they're not reflective. I think a lot of the students in that program, I've seen them in other contexts where they're extremely reflective. You get them more on a one-on-one basis and they ask some really interesting questions and they're really thinking about things." (Project 6, 21stCCLC)

Table 5. Individual profiles of each project. Each project is represented in a column, and the DoS dimensions are listed from top to bottom. Average scores (from 3 observations) have been grouped into indicator of strength or challenge*

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
Relationships	Great Strength	Great Strength	Great Strength	Great Strength	Great Strength	Great Strength
Space Utilization	Great Strength	Great Strength	Great Strength	Great Strength	Strength	Strength
Organization	Strength	Great Strength	Great Strength	Great Strength	Strength	Great Strength
Materials	Great Strength	Great Strength	Strength	Great Strength	Strength	Slight Challenge
Purposeful Activities	Great Strength	Great Strength	Strength	Great Strength	Strength	Slight Challenge
Inquiry	Great Strength	Strength	Strength	Slight Challenge	Strength	Strength
Engagement with STEM	Great Strength	Strength	Strength	Strength	Slight Challenge	Major Challenge
Relevance	Great Strength	Great Strength	Major Challenge	Strength	Slight Challenge	Strength
Participation	Great Strength	Strength	Slight Challenge	Strength	Slight Challenge	Slight Challenge
STEM Content Learning	Great Strength	Slight Challenge	Slight Challenge	Slight Challenge	Slight Challenge	Major Challenge
Reflection	Strength	Slight Challenge	Major Challenge	Major Challenge	Slight Challenge	Major Challenge
Youth Voice	Great Strength	Major Challenge	Major Challenge	Slight Challenge	Major Challenge	Major Challenge

Great Strength = average score of 4.00 or 3.67
Strength = average score of 3.33 or 3.00
Slight Challenge = average score of 2.67 or 2.33
Major Challenge = average score of 2.00 or 1.67

MWEE Best Practices

Overall MWEE Scores

Looking across ratings, there were three elements at which projects commonly excelled, and three elements where there were greater struggles. **Overall, Watershed projects excelled at elements of Issue Definition, Field Activities, and Use of Local Context**, with average scores near the maximum possible (see Table 6, right).

Issue Definition focused on the degree to which sessions articulated a driving issue and students were actively involved in relevant activities (indoors).[6] **On the whole, projects were strong at articulating a driving issue across sessions, and in ensuring active student participation in ways that contributed to understanding the issue.** Project 2 was a strong example; across sessions, their framing and activities were consistently tied to a clear and specific driving issue (i.e., local marine debris). Specificity of driving issues varied considerably (see Table 3 on page 6), which was not a factor considered. Broader driving issues (e.g., impact of human activity on water quality and wildlife in local bodies of water), provided a broader umbrella for considering activity relevance.

Field Activities considered the number of field experiences, their relevance to the issue, student involvement, and use of the field site's assets. **Nearly all projects included multiple opportunities where students went outdoors and engaged in relevant, place-based activities. Strong Local Context scores reflect that the driving issues and the field experiences were well contextualized as locally relevant**, including the relationship between the students, the local environment, and community. This dimension examines the degree to which such connections are made clear in sessions.

"[The students] seemed to have a lot of observations about how [each field site] was different. It was good to see that they could point out, even though there's water here, it's not all the same and it's not all going to the same places." (Project 6, Watershed)

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[6] For rubric clarity, Issue Definition looks at indoor activities; Field Activities looks at outdoor. In a MWEE, background research is conceptually within Issue Definition but, in practice, may be held outdoors and overlap with Field Activities. To minimize double-counting evidence, we examined indoor and outdoor activities under separate elements.

Table 6. Overall average and median ratings from six projects within each MWEE element

	Overall Mean	Overall Median
Scores out of 8 maximum		
Issue Definition	6.67	7
Field Activities	6.50	7
Synthesis & Conclusions	4.67	4
Stewardship Action Project	4.00	4
Scores out of 4 maximum		
Use of Local Context	3.67	4
Use of NOAA Assets	2.17	2.5

Green shading indicates area of strength; gray shading indicates area of weakness

The three MWEE elements where projects had greater struggles were Stewardship Action Project, Synthesis & Conclusions, and Use of NOAA Assets. For these elements, the average scores were around the middle of the possible range, indicating inconsistent evidence. No MWEE elements proved to be consistently absent of evidence across the six projects.

The common challenges experienced with the Action Project and Synthesis strongly reflected the challenges discussed around DoS dimensions of Youth Voice and Reflection, respectively. Many projects struggled to find time and capacity to give students a decision-making role in Action Projects (most were pre-defined for students) or to share conclusions within or outside of class; and they struggled to include dedicated time for synthesis of and reflection on meaning from investigations.

Regarding use of NOAA Assets, results were mixed, with some projects incorporating material or human resources that aligned with their issue and others struggling to do so. Those who struggled tended to experience difficulty in finding pertinent resources, such as the rural, inland project (Project 1), who noted the absence of local NOAA staff and the tendency for resources to be ocean-focused. Others commented on difficulty accessing NOAA experts due to their limited availability (locally or due to busy schedules), and the difficulty of aligning a scientist's schedule with the constrained timeline of an after-school or summer project. Some projects that scored poorly in this dimension (e.g., Project 1 and Project 5) did incorporate local scientists (unaffiliated with NOAA) into their sessions.

MWEE Scores by Project

As with DoS scores, ratings by project tend to mirror patterns in the overall data. The three elements with strong scores were strengths at all or nearly all of the projects. The three elements with overall mid-range scores generally reflected inconsistency, with some projects showing some strength and others experiencing challenges. Table 7 (next page) shows the overall MWEE score profile for each project, characterizing whether its scores indicated an element was a strength or challenge in its observed sessions.

Field Activities were enacted with great strength at most projects; only one project (Project 1) demonstrated challenges in this element. Interviews reflected that this was largely due to uncontrollable weather events; the spring project occurred during an intense period of rainfall, which made planned water sampling field activities unsafe. While the Watershed educators adapted plans and kept the overall student experience on track, the quality of youth involvement in field activities was somewhat limited. Only two partial field experiences were observed; one of which was impromptu, rather than planned, and made less intentional use of the assets provided by the field setting. However, in the absence of the weather event, it is likely that this project's Field Activities score would have been more on par with the other projects.

On the flipside, **the Stewardship Action Project proved to be slightly challenging for about half the projects, but Project 1 demonstrated great strength – scoring an 8 out of 8.** As with the Youth Voice dimension in the DoS framework, a component of the Stewardship Action Project rubric examines the degree to which the youth are involved in choosing and/or designing the action project. Including the time and flexibility for youth decision-making proved to be difficult for many projects; but observations at Project 1 showed that they gave the youth a role in both choosing and designing their project. After doing water quality tests, the students chose the project of presenting their findings to a local city official; in a subsequent session, they worked with the adult Watershed educator to plan and execute the sharing of their findings.

Only two of the six projects experienced major challenges with any of the MWEE elements. Project 5 and Project 3 struggled with the same two elements – Synthesis & Conclusions and Use of NOAA Assets. For the two projects with the lowest scores, there was no evidence of NOAA resources in their observed or planned sessions. Across interviewees, some of the projects acknowledged that integration of NOAA resources and scientists that align with learning experiences is an ongoing challenge in many of their watershed education programs.

"This is what we struggle with our NOAA B-WET [programs, generally]. I do think there's a lot of resources that NOAA has that could be utilized. …I like the people that come in from NOAA. That works really well, getting students to hear from real scientists and people out there doing work. That part I like. The online resources I have a hard time with, because… I don't want kids to get on the computer and play around. I want to have an activity, a hands-on thing that they're doing. I do struggle a little bit with which resources make sense to use." (Project 3, Watershed)

The challenges within Synthesis & Conclusions varied. For Project 5, scores were lower partially because the project was designed to follow each morning-long field experience with a shorter classroom session to debrief and reflect on the experience later in the week. Observations only captured the main field experiences, it is possible more synthesis work occurred in the other times. For both Project 5 and Project 3, the projects lacked evidence of time for students to share their conclusions out, either with their fellow students or beyond the project. Project 1 and Project 4 were the only two projects observed that successfully incorporated out-group sharing of conclusions; one through the student presentation to a local official and the other through creating a set of murals depicting human and natural systems in the local watershed to be displayed at the students' middle school.

Table 7. Individual profiles of each project. Each project is represented in a column, and the MWEE essential elements are listed from top to bottom. The score given to each project have been grouped into indicators of strength or challenge*

	Project 1	Project 2	Project 3	Project 4	Project 5	Project 6
Issue Definition	Great Strength	Great Strength	Great Strength	Strength	Strength	Strength
Field Activities	Slight Challenge	Great Strength	Great Strength	Great Strength	Strength	Great Strength
Action Project	Strength	Strength	Major Challenge	Strength	Major Challenge	Slight Challenge
Synthesis & Conclusions	Great Strength	Slight Challenge	Slight Challenge	Strength	Slight Challenge	Strength
Local Context	Great Strength	Great Strength	Slight Challenge	Great Strength	Great Strength	Great Strength
NOAA Assets	Slight Challenge	Strength	Major Challenge	Strength	Major Challenge	Strength

Great Strength = score of 7-8 out of 8, or 4 out of 4
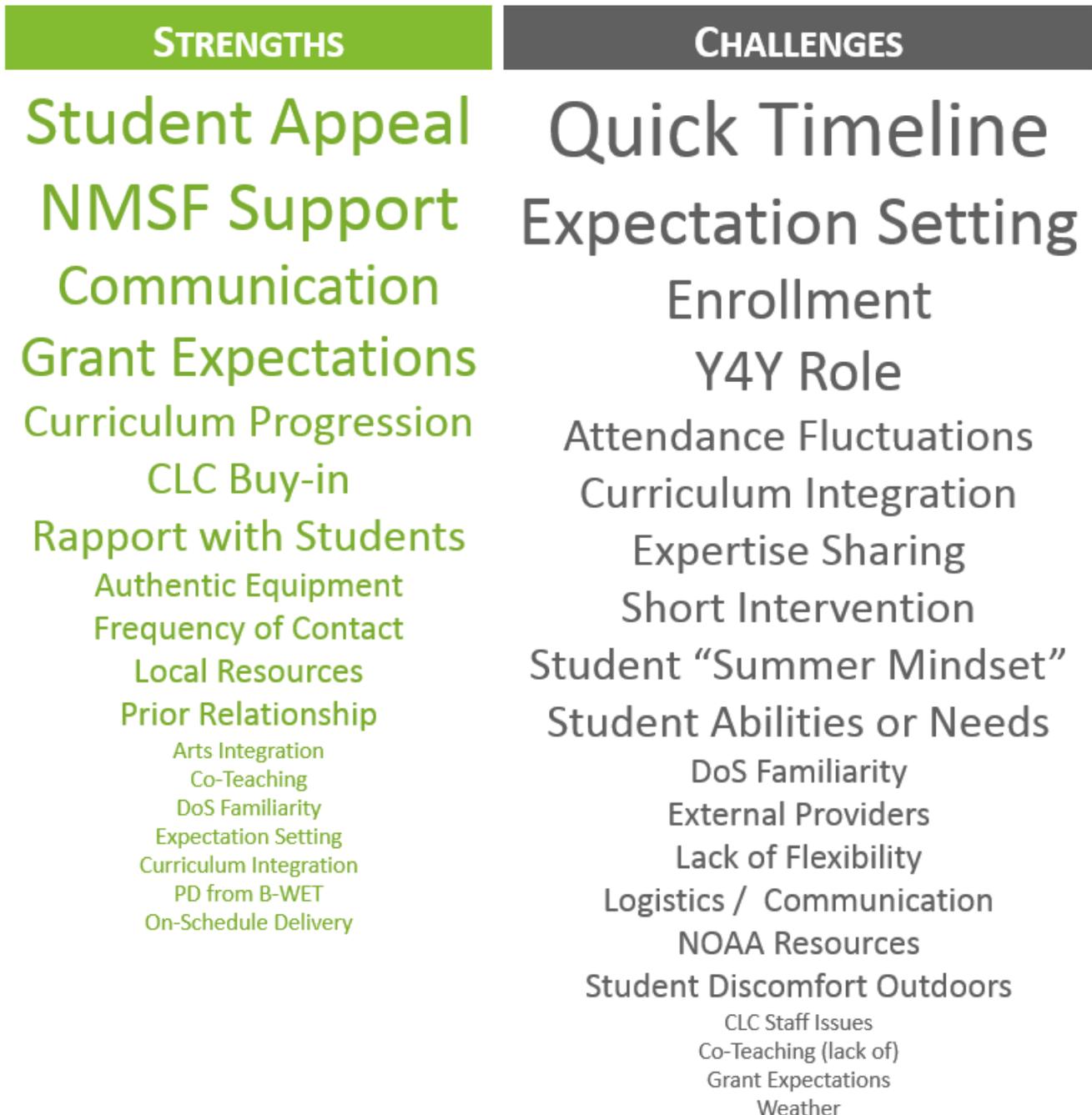*Strength = score of 5-6 out of 8, or 3 out of 4*
Slight Challenge = score of 3-4 out of 8, or 2 out of 4
Major Challenge = score of 1-2 out of 8, or 1 out of 4

Strengths and Challenges in Implementation

This section examines the strengths and challenges that educators reported at each phase of implementation: 1) Planning & Collaboration, 2) Curriculum Design, and 3) Curriculum Implementation. Data come from nine stakeholder interviews with representatives from all six Watershed grantees and three 21stCCLCs. Figure 3 visualizes the overall prevalence of themes across the interviews. Overall strengths were student appeal of projects, support related to the grant, and communication between Watershed and 21stCCLC partners. The most common challenges were the short planning timeline and setting expectations between partners.

Figure 3. Word clouds of coded themes of strength/challenge; larger words indicate more interviewees referenced that theme

STRENGTHS

Student Appeal
NMSF Support
Communication
Grant Expectations
Curriculum Progression
CLC Buy-in
Rapport with Students
Authentic Equipment
Frequency of Contact
Local Resources
Prior Relationship
Arts Integration
Co-Teaching
DoS Familiarity
Expectation Setting
Curriculum Integration
PD from B-WET
On-Schedule Delivery

CHALLENGES

Quick Timeline
Expectation Setting
Enrollment
Y4Y Role
Attendance Fluctuations
Curriculum Integration
Expertise Sharing
Short Intervention
Student "Summer Mindset"
Student Abilities or Needs
DoS Familiarity
External Providers
Lack of Flexibility
Logistics / Communication
NOAA Resources
Student Discomfort Outdoors
CLC Staff Issues
Co-Teaching (lack of)
Grant Expectations
Weather

Planning & Collaboration

Strengths in Planning & Collaboration

While all six projects discussed areas of strength in planning and collaboration, the themes discussed were quite varied. **Two themes were most commonly mentioned (by around half of projects): that communication between organizations was strong and that 21stCCLC leadership demonstrated buy-in to the project and approach.** Comments about communication focused on clarity, timeliness, and productivity. Discussions of leadership buy-in reflected higher-level enthusiasm from partners, which was supportive to the overall endeavor.

"They [21stCCLC leadership] were receptive to what we wanted to do and they did what they could to make it all happen and make sure the kids were able to get the experience that we were trying to offer. I'd say it was positive to work with them." (Project 6, Watershed)

Other themes related to strength in planning and collaboration were each mentioned by two projects. These themes included building on a pre-existing relationship between the Watershed and 21stCCLC partner; success with the PD provided by the Watershed partner to 21stCCLC staff; and of clarity in expectations about roles and contributions for each partner. **One other theme, mentioned by two projects, was experiencing success through sharing of expertise between 21stCCLC and Watershed partners.** This mutual learning contrasted with one-way PD, noting the added value for Watershed grantees to learn from 21stCCLC expertise with youth and communities. For one project, this only emerged during their summer iteration, and not the spring after-school project (the observed project).

"I like the idea of teaming up with someone who has another expertise than myself. I love this team that I've got going. [One person brings] the art piece and ocean advocacy; the literacy teacher, who also brings classroom management tricks and things; and then, me who brings all the watershed outdoor learning science-y stuff. It's a really great combination." (Project 3, Watershed)

Challenges in Planning & Collaboration

There was more consistency in the themes about planning and collaboration challenges experienced by the six projects. Overall, this was an area where projects learned from experience, discussing things they might do differently in future iterations. **The universal sentiment – heard from every Watershed partner – was that the short timeline to create a proposal and then implement the project presented challenges and limitations** to their implementation. These comments were very frequently connected to statements about other challenges experienced – whether in building the 21stCCLC relationship, supporting expertise sharing, curriculum design, or increasing enrollment. Generally, with a longer timeline for relationship-building and planning, Watershed grantees felt they could have better addressed limitations from the outset.

"I think we might be able to get a jump on attendance and just have a better relationship with our partner from the get-go. Of course, we have a great relationship now, but the beginning was a little sticky because we were rushing. ...There was kind of a scramble in the beginning. I think the biggest change would just be a little more prior planning or more time in the beginning to get everyone oriented to what was about to happen." (Project 2, Watershed)

"I think from the very beginning of the opportunities, the short turnaround of the development of the proposal. ...I put the program together as quickly as I could. But that did not give time for me to really work with the CLC sites as true collaborators in the development of the program. They were willing to have us come in and deliver programs, more than willing – delighted and excited. But the program wasn't integrated into the whole academic program, where it could have been integrated more." (Project 5, Watershed)

Just over half of projects also talked about challenges with enrollment. These included instances of lower-than-expected enrollment (Project 4, Project 2, and Project 1 spring); of higher-than-expected enrollment (Project 1 summer); and different grade-level than expected (Project 6). In all cases, enrollment was the responsibility of the 21stCCLC partner.

Another theme, mentioned by just over half of projects, was **some degree of misaligned or unclear expectations between the 21stCCLC and Watershed teams.** This included times that the project may have been clear to 21stCCLC leadership, but not as clear to the day-to-day staff, or when 21stCCLC staff indicated they felt they could have used more advance detail or information about the project.

"Someone in the main office at [the 21stCCLC] was well-aware of the partnership that we were entering into and what the logistics would be as far as the required professional development workshops, and a little bit of independent work, and that there were stipends included. But I'm not certain that that information was shared with the people who would actually be involved in the professional development." (Project 2, Watershed)

"I think from our perspective, it wasn't, we weren't really sure actually what it was going to be. Everybody had their own ideas about what it would be like. I'm not sure, I know [the 21stCCLC director] did a lot of meetings with [the Watershed partner]. … I wasn't at that meeting, [and] a lot of the expectations for me, I wasn't quite sure the direction it was going to take. I think maybe [the 21stCCLC director] had a more clear idea about it." (Project 6, 21stCCLC)

Day-to-day communication, however, was only a challenge at a few projects, and the issues were generally minor. One example that cropped up was challenges with parental communication – permission slips, arrival timing on field days, etc. There was need for great logistical clarity so that the Watershed partner's expectations were clearly communicated to parents by the 21stCCLC.

Finally, some challenges stemmed from a lack of expertise sharing. **Three projects felt that the Watershed-to-21stCCLC PD model (explaining project trajectory and concepts) missed opportunities for learning about 21stCCLC approaches.** Many comments called out behavior management systems as an area where Watershed staff could have benefited from preparation. Although they quickly adapted to 21stCCLC approaches while underway, they noted the potential value of more intentional prior sharing.

"The professional development that I had planned is about watersheds…. We did a three-hour watershed workshop. That was just science content-based. What I'm thinking of is, if I sit down with the [21stCCLC] staff and we have planning time together and we plan out okay, these are the activities we're going to do. What are the pieces? What is the role that you'll play? How can you support this?" (Project 3, Watershed)

"I think the most useful thing [would be] just talking to the center staff about the kids. They see most of those kids all year. Just how they interact with them. It was a big adjustment for me when they were like, 'We have this severe discipline policy of one warning, and then they get a timeout.'" (Project 6, Watershed)

But two projects suggested that mutual learning could go beyond classroom management. They talked about connections between environmental issues of interest to Watershed grantees and some 21stCCLC partners' focus on social justice. Through the pilot, projects saw how watershed education could be framed within social justice and integrate the two curricula and relevance for students.

"One of the [21stCCLC] staff members was talking about the different social justice issues that they discuss throughout the school year, and that they would like to use marine debris as a starting point next school year because it's something that most people can agree on." (Project 2, Watershed)

"A lot of our advocacy falls within social justice, and a lot of things happening within our own neighborhood and in our own community. …And I think within that context, there is a way to tie in environmental issues with that. …because if this happens it affects their own lives, their own neighborhood." (Project 6, 21stCCLC)

Curriculum Design

Strengths in Curriculum Design

As with planning, pilot projects talked about a wide range of strengths in their curriculum design process, but few were dominant overall. Three strengths were felt by half or more of the pilot projects. **More than half felt they had success at structuring and organizing their project to build students' understanding, step-by-step across sessions.** This sometimes tied to reflections of strength in the Purposeful Activities dimension of DoS. These strengths reflected careful planning and design work by the Watershed grantees.

> *"That's how I felt the program built, and that was what was good about it. It wasn't just, 'Okay we're doing this. All right, onto the next thing.' [The Watershed grantee] built the program from the first Friday all the way through the program, even with her sessions that she had during the week with the students. They were able to use all the things that they started with and collaborate at the end."*
> *(Project 1, 21stCCLC)*

Other strengths emphasized by half of projects included designing curriculum that made use of rich local resources and curriculum that employed authentic, scientific equipment in meaningful ways. These strengths also aligned with DoS and MWEE elements. These interviewees expressed awareness of specific rich local resources – including field locations and local partners and scientists – that they knew how to use to enhance student experience. With equipment, the projects noted the value for student learning of their ability to incorporate real tools into the experience; some equipment resources were only available because of the current grant funding.

> *"As a project manager, I depended upon my partners to provide the programming at the different sites we went to. So we had very strong partners at [various local partners]… How they choose their educators, how they train their people. We are really fortunate to have those strong partners." (Project 5, Watershed)*

Other strengths in curriculum design were present in interviews, but only mentioned by one or two projects. Some of these were attributes that were particularly distinctive to a project's approach, such as **the value of arts integration in the Watershed curriculum – a strategy used by Project 4 and Project 3.** These projects spoke about their pedagogical approach that not only engaged students but used integration of disciplines to enhance learning.

> *"I think bringing it all together really helps every part of their brain to kind of think about it in a different way. … [For example] It was taking things we learned about out in plays, the MWEE's we've had, and putting it into the context of imagination. Then, bringing in the human impact and tying it altogether with this crazy art mural with pollution dribbled all over it. It was really fun, and they got it. …Then, one we're going to do in a couple weeks is have them do a creative writing piece, where they'll come up with a story about how some piece of trash got to the beach. We're going to go out and collect trash, and then, they're going to sit down and think about how it got there, what happened to it. What was the story along the way?" (Project 3, Watershed)*

> *"We found that there's a lot of research that shows that doing art/science integrated programming not only improves test scores but improves engagement and learning and all those indicators that suggest that students will be more successful if you can integrate those curricula. … When the students are on the boat, they are making observations and recording their observations using art. Traditional scientists, when you think about naturalists many years ago, they would make observations and they would record their observations in sketches. …So, when the kids are on the boat they have some time to reflect on where they are and make observations in a really quiet, peaceful place and then, of course, they're recording those observation using their painting. And so, they're literally taking a little piece of [the bay] with them because they use the water right outside of their boat to paint." (Project 4, Watershed)*

Similarly, representatives from two projects noted strengths in ways that they were able to integrate and extend the Watershed curriculum through activities and curriculum at the 21stCCLC. This was most strongly observed for Project 2, where the 21stCCLC partner carried out a number of extension activities beyond the course of the planned outreach sessions. The other instance was at Project 5, where one of the 21stCCLC educators reported multiple efforts she made to do follow-up, preparation, and extension activities with her students beyond the field activities. At this project, however, it was not clear such activities were widespread for all 21stCCLC educators.

"I was encouraging them to try to create a final project or extend the project beyond the services that we were providing. I knew that they would, but I just was really blown away at the breadth of what they were doing. There's a rap song that the scholars made under the leadership of one of the [21stCCLC] instructors. They have full-out service learning plans written up that they're going to implement this summer that tie into what we did this spring. It's really quite amazing." (Project 2, Watershed)

Other curriculum design strengths mentioned included projects that felt the experience benefited from the high frequency and regularity of interaction between the Watershed educator(s) and students (whether daily or weekly). A couple of Watershed representatives noted that the DoS framework was familiar or well-aligned with the pedagogical principles they already use, and one commented on enjoying the flexibility of the after-school setting for experimentation and freedom to explore ideas, in comparison with K-12 classrooms.

Challenges in Curriculum Design

There was no single element of curriculum design that all projects agreed had been a challenge, but there were several themes common to several projects. **Interviewees from four projects commented on the challenge of curriculum design within a short intervention.** As seen in the project attributes, most projects included around 6-8 sessions of 1-3 hours each. Representatives from these projects noted ways in which they had to make choices about what to emphasize, given limited time. Several noted that the short intervention was a reason why it was difficult to achieve more with the Youth Voice and Action Project dimensions, sometimes even describing other B-WET programs – within formal education settings - that are able to incorporate more student choice due to longer timelines.

"This school year B-WET program that we do, the kids create a poster that talks about what their watershed is and then ways that they could reduce their impact on their carbon footprint in their watershed. …We took that project out of what we were planning for the summer one because we didn't know how to fit it in to six weeks." (Project 6, Watershed)

A parallel discussion was a lack of integration between the Watershed curriculum and the larger 21stCCLC curriculum. In contrast to the Project 2 example discussed earlier, where the 21stCCLC engaged in extension activities, other Watershed projects were stand-alone learning experiences. Given its relative brevity, some Watershed leaders felt this constrained the goals it could achieve. Comments suggest potential for future integration; however, at least one project noted concern that not all 21stCCLC educators may be comfortable leading STEM-focused instruction independently.

"As far as I know, they didn't do anything between sessions. Something that I would like to have changed, [would be] to have them doing more things to back it up, in the future if it happened again. In our school year program, our teachers do extra classroom activities. I think it's helpful for them." (Project 6, Watershed)

"It was challenging. And then also staffing, the fact that, you know, their staff aren't, their summer staff aren't trained educators. They are not comfortable with science." (Project 5, Watershed)

Comments about both of these issues – the brevity of the intervention and its isolation from the rest of the instruction – were sometimes directly articulated as a contrast between the informal project and the traditional design of MWEEs for formal education settings. These comments noted that MWEEs delivered as part of a traditional, formal education curriculum benefit from longer intervention timelines and active involvement and extension of instruction by an experienced classroom teacher, which occurs between visits from the Watershed grantee.

Three of the projects also discussed challenges with integrating appropriate NOAA resources into their project – whether educational or human resources – as discussed in detail in the review of MWEE best practices. These comments suggested that many future projects could benefit from PD and examples about integrating appropriate NOAA resources.

One other theme heard from about half of the projects was challenges related to a lack of flexibility of the 21stCCLC projects. The specifics of these comments varied, but included adapting to the daily structures and routines of the 21stCCLC schedule, and generally seemed to be relatively minor accommodations.

Finally, interviews from two projects indicated that the Watershed representative was not extensively familiar with the DoS and/or MWEE frameworks. While their projects aligned with many of the dimensions, this suggested that the frameworks may not have had as direct a role in the curriculum design process.

Curriculum Implementation

Strengths in Day-Of Implementation

One consistent strength in partners' views of curriculum implementation was that the Watershed activities had very strong student appeal. In interviews from five of the six projects, leaders talked about the enthusiastic and excited response from youth to the experiences of this project. The only interviewee who did not mention this theme had not interacted directly with students; but observational data confirmed strong scores of student engagement and appeal for the experiences at this project as well. In particular, the inclusion of field excursions was noted as appealing for many youth, in some cases boosting enrollment and attendance.

"After the program was over, the [21stCCLC] director actually said that they were reviewing their attendance for the whole year, and they saw a clear spike during the time that [our project] was happening." (Project 2, Watershed)

"There's three [21stCCLC] tracks this Summer. My track, the program that I'm doing, has 20 kids. The other tracks don't have as many kids because the students were able to self-select, and they love the program. They really do. They're having fun. They're engaged. They're loving it." (Project 3, Watershed)

"The kids were super excited to get to go on field trips and be outside in nature. I heard many kids tell me that that's why they signed up for it, [because] it included going on field trips to these places. …A lot of the kids were saying, 'Yeah, I wanted to do it because it said we also got to go on a field trip.' The big draw." (Project 6, Watershed)

Likely related to students' positive response, **about half of the projects reflected on how well the Watershed educators had built rapport and relationships with the 21stCCLC students.** This connected with the DoS Relationships dimension, which was discussed earlier in the report. From the comments of one 21stCCLC staff, this skillset among the Watershed staff was critical to the strength and potential for achieving outcomes of this project.

"Since I do work with urban children, we do have other programs that come in for different reasons, and sometimes it's harder for the people to understand where kids are coming from or to communicate with them on a different level because they do have different backgrounds. The people from [Watershed grantee] that came to work with our children just blended with them flawlessly. They worked with them in a way that I've never seen anyone work with our kids before and our kids responded to it really well." (Project 5, 21stCCLC)

Other strengths in day-of implementation, beyond those discussed within the DoS and MWEE frameworks, were mentioned by fewer projects. Two noted that they had been able to implement their curriculum plans thoroughly, as planned, and staying on schedule throughout the project.

Notably, two leaders described success in summer projects through incorporating 21stCCLC staff as co-teachers during project sessions. For most projects observed, Watershed educators facilitated, while 21stCCLC staff supported classroom management. The contrasting examples mentioned in interviews were from portions of projects not observed in the study; both were from summer sessions where we had observed the spring sessions (solely led by Watershed staff). This suggested that collaboration, such as co-teaching, benefited from more time and relationship-building between partners.

"We conveyed really clearly that [21stCCLC staff] were going to be co-teachers with us, and that we would be setting the program but had designed it in such it in such a way that they could take instant sub-group leading roles. …So they were co-teachers and they rose to that and they did really well in that model." (Project 1, Watershed)

Challenges in Day-Of Implementation

Interviewees reported a range challenges that were experienced in the course of curriculum implementation with students, which all suggested future opportunities to improve either curriculum design or planning in order to better prepare for such experiences. **The most common theme was perceived challenges presented by students' mindsets or approaches to the tasks** of the projects, expressed by all projects. The specific experiences were varied. Three projects (one urban and one suburban) noted that some students were uncomfortable or apprehensive in outdoor experiences. This created challenges that ranged from low attendance on a boat trip (parents wouldn't sign off), difficulty paying attention, and visible emotional distress during a field activity.

"Working with urban children a lot of the times it was their first time going out in nature, a lot of them have never even been to a lake before, which is really surprising. The challenge was some of them were not very familiar with the insects and bugs that were around, so that did deter some of their participation; just a couple children, not all of them. That was one of the hardest challenges was trying to focus the children in when it was hard for them to be around environments they've never been in before." (Project 5, 21stCCLC)

Other challenges noted by Watershed and 21stCCLC staff from two projects were **issues with students being in a "summer mindset," which indicated resistance to any experience that felt "like school."** This seemed to impact Participation or STEM Content Learning Scores within the DoS framework. For one after-school project, held on Fridays, interviewees also felt that students' perceptions of it being too "academic" for a Friday may have contributed to low enrollment.

"Because during the year, a lot of time students are more in the academic mode and they're more receptive to a learning experience, where the summer we definitely get a lot of resistance in terms of 'I don't want to do this, this sounds like school' kind of thing. So, I think that is something that can be really a challenge, and keeping them engaged. And it's definitely something we've encountered during the program. [But] I think experiences that are, like the ones we did with the field trips, that tends to really help in terms of engagement." (Project 6, 21stCCLC)

Other student-level challenges varied, including adapting to students with learning differences; two projects served students with behavioral or learning challenges. One 21stCCLC leader noted that students also had trouble focusing when the work felt too difficult.

A challenge for a majority of projects was fluctuating attendance at sessions; many 21stCCLC students did not consistently attend all sessions in the project. Some dropped in and out or came to just one field experience, while some were consistent throughout a cycle. This was unexpected to most Watershed educators and made implementing a curriculum that built on prior experiences challenging. This challenge was seen across spring and summer projects and whether a 6-week or 3-week duration.

"I think the big challenges were just the numbers that we had. Part of that was, I think, the site wasn't getting as many people, as many students, coming regularly as they had hoped. But then, just the sheer nature of a summer program, kids are more in and out whereas in a traditional, 21st Century [after-school] program, because they have to be at school every day, you're more likely to see those same kids every single day. But in the summer time they go on vacation or they have a different camp or whatever and so it's harder to have that." (Project 4, Watershed)

About half of projects reported challenges with quality in the role played by an external partner. These ranged from challenges with quality of or communication with an outside expert or field activity leader (i.e., not Watershed staff) or a science expert's ability to fit into a teaching role. Interviewees were reflective about choices they could make in the future based on this learning.

Other issues were mentioned by a couple of projects each. Two themes were raised related to the role of 21stCCLC staff during sessions. Two projects felt it would have been improved if 21stCCLC staff served as co-teachers during sessions, and two projects reported some specific, and relatively isolated, instances with 21stCCLC staff support during programs – either the 21stCCLC staff were less present than expected or, in one case, acted as a negative role model for student participation. In the latter case, an example was observed during which a 21stCCLC educator took a group of students to the restroom and did not bring them back for the last one-third of the session.

National Support & Resources

Strengths from National Support

Across the board, Watershed grantees reported that a great strength of the overall program was the clear, timely, and supportive communication from the Foundation throughout the process. In addition to clarity of communication, there were numerous examples given of how the main contact at the Foundation had provided help with needed troubleshooting and adaptations throughout the process.

"I found support from NOAA and the Natural Marine Sanctuary Foundation was terrific. I was told if I had a call or if I had an email, it was going to be answered. I felt there was flexibility, sometimes I had to move budget items around, there was great flexibility with that." (Project 5, Watershed)

"Kudos to Natalie at National Marine Science Foundation who followed up with our request to have a little help with thinking how to more make sure that NOAA felt good about our connection with NOAA in this project. We emailed back and forth a little bit." (Project 1, Watershed)

The majority of projects also reported that they felt all of the expectations from the grant and then during the award process were made clear to them and were reasonably easy to follow. Challenges related to grant expectations were relatively minor, and only indicated by two projects. They seemed to relate either to dealing with the press packet or whose responsibility it was to get photo release forms from parents. One project was unclear about whether there was a requirement to partner with a Marine Sanctuary.

In addition, one project noted the benefit of having been able to take advantage of a professional development session arranged by Y4Y in their region, which was a benefit. And one project specifically expressed the critical value of this grant's funding for making this project, the provision of authentic experiences for students, and collaboration with the 21stCCLC possible. While it was likely true for all of the projects, one specifically called out the critical value that the funding played.

Additional Needs for Support

The discussion of challenges with respect to the national-level organizations tended to focus on whether there were specific areas of need that either NOAA or State/National 21stCCLC organizations could better support local grantees. **One theme that emerged for a majority of Watershed partners was a lack of clarity about the role of Y4Y** in the project. The comments suggested a disconnect or lack of awareness from the outset about expectations around using or accessing Y4Y resources, particularly in conjunction with the quick timeline for ramping-up projects.

"One of the things that was really confusing about this program in the beginning, was that all of the sudden the Y4Y came in. But we could only access it if our partner wanted to access it. …They were busy and we never really got a chance to hook up to figure out whether or not they wanted to access the same units that we would want to access and so there was some resources there that weren't exactly available to us." (Project 4, Watershed)

"One thing that I found frustrating was that I didn't know that there was going to be that Y4Y component from the Department of Education, and boy, I just couldn't wrap that in. There was no time at the CLCs to wrap any of those great materials in, the outward training, the tech help, it was a bridge too far. … If we had started with that knowledge from the very beginning, that would need to be the through-line, if that was really important. I just I didn't find out about that soon enough to figure out how to wrap that in, without lessening the professional development I felt those educators really needed to get." (Project 5, Watershed)

Others were able to articulate specific PD opportunities that they would value, including strategies and techniques around:

- Incorporating NOAA resources (Watershed)
- STEM education best practices (Watershed)
- Maximizing Youth Voice in projects (Watershed)
- Classroom/behavior management (Watershed)
- Inquiry-based teaching and learning (21stCCLC)
- Asset-based approach to project development (21stCCLC)

Outcomes Observed by Project Leaders

Based on the observations made by project leaders from Watershed and 21stCCLC partners, all of the pilot projects felt they had success at impacting students' knowledge, attitudes, and behaviors related to their local watershed. In addition, the staff of the partner organization also tended to feel they had gained skills and knowledge from working together, and the majority of projects indicated plans for future partnerships.

Student Outcomes

In interviews, **all six projects reported ways in which they felt they had observed gains in students' knowledge about watershed concepts and change in watershed protective behaviors.** In terms of knowledge gain, projects described ways they saw students retain information and apply it in later sessions – or even after the project had ended. This included vocabulary or understanding of what a watershed was, for instance.

"[In final evaluations] several students do a very eloquent job of explaining the connection between rain, litter, storm drains, underground pipes, and outfalls." (Project 2, Watershed)

"I have four kids in the Summer program that were in the Spring program with me, and they remember all sorts of things. They're the ones who are chiming in and piping up and volunteering answers." (Project 3, Watershed)

"They were able to use words they hadn't used in the beginning. You know, add questions that they had never posed before. They really began to talk in that, in the way that people talk when they are exploring. So, that changed." (Project 5, Watershed)

"[Staff from another local program] remarked that the kids in their STEM week kept referring about what they had learned and done in their [project] week." (Project 1, Watershed)

"One of the examples is [the Watershed educator] was asking what's a watershed, and the students couldn't really answer that. They'd say, 'Oh it's a shed with water,' something like that. Then as the program went on, a lot of these questions were reiterated and they were able to give informed answers to them. And I think the value of a program like this is, we can measure that gain, that short term gain, but I think it has a really long-term effect on the students. I think it really plants a seed in terms of their future growth, and their ability to actually be engaged in their science classes." (Project 6, 21stCCLC)

Additionally, at least one interviewee from each project reported evidence of students taking a pro-environmental action or behavior. Examples ranged from talking with parents, to participating in a trash clean-up, to specific actions taken – such as taking shorter showers or not littering. These impacts can be difficult to measure, but the interviews suggest anecdotal evidence that projects had impact.

"Another student said something that was on a smaller scale but personal level. The other day when he was drinking a can of tea, he decided to put it in his pocket instead of throwing it on the ground." (Project 2, Watershed)

"…After they went to [a water reclamation facility] where they were telling them different things that you can do to preserve water at home. And they would come back and tell me, 'I made sure that I took a shorter shower this morning' or 'I made sure I turned off the water when I brushed my teeth.' They were taking things home and were telling me they were actually excited to tell their siblings and their parents about what they learned." (Project 5, 21stCCLC)

Five projects talked about ways they saw students' attitudes change through the projects, including making a personal connection with their watershed. Examples included building a sense that they live in a watershed and attitudes about what makes their watershed special and valuable to their community.

"We don't have crystal clear blue water like Florida does, and so most people have this perception, this misperception, that just because our water is not clear that it's polluted. [Students] are more likely to say that they disagree that [our bay] is beautiful beforehand, but after they've been on the kayak adventure they more strongly agree that it is beautiful. So, we find that to be a really positive impact on the kids that, no, our estuary does not look like other estuaries but it's still beautiful and there's still value in it and they're more likely to protect it." (Project 4, Watershed)

Attitudes toward STEM careers was an articulated goal of the NOAA-21stCCLC program, and four of the six projects felt they had achieved some progress. For some, the responses focused on building awareness of career options – particularly those projects that had incorporated interaction with a professional scientist about their career. For others, it was more that the project highlighting that science was accessible. At least one noted that it was hard to determine what effect a project like this would have on such a long-term outcome.

"Exposure to the sciences and the thought that STEM careers are something that they could do… I just really think that these types of programs are so important because our youth do not realize that they can do these things. They always think it's someone else that's not their race, gender, ethnicity, socioeconomic background doing these things. In fact, in the pre-survey, scholars indicated that they liked science, technology, engineering, and math, but they did not want to have a career in science, technology or engineering and math. By the end, a lot of them did want to have a career in science, technology, engineering, or math." (Project 2, Watershed)

"Well, I can't really say about the spring because that was such a small sample. I know one of them at least really likes science and wants to keep doing science. We did not turn them away, did not turn them off. They got more interested and that was I think pretty obvious." (Project 1, Watershed)

Finally, each of the projects brought up at least one other aspect of student impact that had stood out to them, but which had not been articulated as a priority outcome. **A majority of projects focused on the benefit of access and exposure to new places as an outcome in and of itself.** These comments, which often came from 21stCCLC staff, reflected the opportunities provided by these projects that were not a given for many 21stCCLC students. They also suggested an impact of broadening students' viewpoint on their community; as one interviewee stated:

"For these youths it was like their world got bigger and they got to be in that bigger world in a way that they never had before." (Project 5, Watershed)

Interestingly, **the three projects that commented on student discomfort outdoors being a barrier in implementation also noted that felt they saw evidence of students' comfort with the outdoors increasing**, at least slightly. Comments ranged from a general sense that they learned to be "less afraid" to specific examples of enthusiasm in reflecting on an outdoor experience or initiating outdoor explorations in between project sessions.

"…even when it wasn't time with watershed [programming], they would like to take their backpacks outside and observe things with the tools that they were given [by the project], like their magnifying glasses, their bug boxes. They liked to go outside, and they had never asked me to do anything like that before. They preferred to stay inside and play on the computers or play basketball or dodgeball in the gym. But ever since watershed has come, they like to take their bags outside and do more things outdoors as far as observing things." (Project 5, 21stCCLC)

Finally, three projects observed ways that they saw positive impact on students' self-esteem and empowerment from being respected and trusted by Watershed educators. These comments ranged in intensity. One project (Project 3) voiced that students felt that "somebody cares" about them, while another (Project 1) spoke of seeing a group of girls' excitement and empowerment build in through a civic-minded Action Project. The most profound reflection on this impact, however, was from both the Watershed and 21stCCLC partners in an urban setting that worked with two 21stCCLCs, one with primarily African American students and one with primarily Hispanic students:

"I think oftentimes, I believe these kids don't feel like they are trusted. …One of the kids, they wrote us a thank you note, and this one phrase about that really stood out, it's 'We were given responsibilities, like taking care of cameras and GPS and water quality tools.' Like that was really special. We trusted them with equipment. We didn't admonish them, we just… You know it's just like, 'They are yours to use.' … Some of the really important things happening during this program, and I think by the emphasis on schools in need, or community learning centers in need, is that there's something else that's going on, that's equally of value. And it's that crossing racial divides and attitudes about this. 'He trusted us.'" (Project 5, Watershed)

Partner Outcomes

Interviews only scratched the surface of the potential impact on the two partnering organizations in these projects. However, one important outcome was that **half of the projects described ways in which the Watershed and 21stCCLC organizations would continue to see each other as a new resource**, including some who were discussing future relationships.

> *"There's potential I think, greater potential now at both centers to continue some kind of relationship, a little bit, and this would be with the CLC as it operates during the school year. ...Some of the kids come from school into the CLC program, so seeing there may be potential there, so the plus would be that I think that connecting with them through the summer will make a pathway to connecting with the CLC program during the school year." (Project 5, Watershed)*

> *"...We're [now] the library for schools, we're the lending library [of scientific equipment]. This is a better use for some of the equipment. ...[It] creates, what I would say, a happy codependency between a school and the EE [environmental education] partner. We've got the goods, but don't worry, we clean the boots and we dry them and stuff. You don't have to store all that stuff, but we have it. That's why you need us." (Project 1, Watershed)*

In addition to these relationships, both sides of the partnership talked about gains in staff skills and competency from working in a new domain. **For 21stCCLC staff, there was reported learning of better understanding the watershed concepts and human impacts on natural systems.** Most of the 21stCCLC educators were not from a science background and many were unfamiliar with these core principles. One Watershed partner reported impacting the involved teachers' use of the outdoors in other settings, and another indicated that one of the 21stCCLC educators was encouraged in her interest to pursue a career in environmental education.

> *"It was outside my educational background, but it was totally worth it. I mean, learning about the watershed and the environment and recycling and all kinds of different things that came about with this project was very important to me and has opened my eyes up to a lot of things." (Project 1, 21stCCLC)*

Among the Watershed partners, staff expressed learning more about how to work with students in the 21stCCLC environment. Some of the examples included learning from the 21stCCLC staff about techniques in classroom management, putting more structure to lessons, and about specific needs or viewpoints for youth and communities that are connected with a particular 21stCCLC site.

> *"Being able to work with folks that are green in the area of environmental ed but that have so many strengths in other subject areas, to collaborate with them was really amazing. I honestly was surprised at how much we learned from each other. ... That marine debris is a social justice issue. ...A really neat new perspective." (Project 2, Watershed)*

One project reflected that they planned to take some of the activities they tested with the 21stCCLC site and incorporate them into their K-12 B-WET programs. And two projects reflected on the benefits of getting to connect and network with other B-WET or Watershed education providers regionally or around the country.

Exploration of Differences by Project Characteristics

With a sample of six projects, it is not possible to definitively link characteristics with evidence of success. Observations and interviews highlighted that each project had a distinctive mix of quantifiable characteristics (class size, duration, timing, grade level) as well as more intangible variables, such as the pedagogical experience of Watershed leaders or the instructional comfort of 21stCCLC staff. To help understand this pilot implementation, we explored all data – DoS scores, MWEE scores, and interviews – for evidence of emergent trends that might suggest differences tied to project characteristics. While these trends are not definitive, they may be useful to structure guidance for future grantees by highlighting strengths or challenges to which projects with a given characteristic might be particularly attuned in their planning and implementation.

Group Size

In examining DoS and MWEE scores, data suggested that class size might have some relationship to several DoS and MWEE dimensions. We visually examined the differences in scores between small groups (avg. 5 students), medium groups (avg. 12 students), or large groups (avg. 26 students) and saw some possible patterns. In general, large classes tended to have lower scores than small or medium classes; but in most cases, these differences were small and may not hold up with a larger sample of projects. Further, with only two projects' scores in each group (small, medium, and large), there is concern that patterns are strongly influenced by a single project being particularly strong or weak in a given dimension; results should be interpreted cautiously.

Two dimensions with a most substantial difference were Engagement with STEM and Participation; the two large classes scored 1.0 point or more below the small class sizes, with medium sized groups in the middle. It is conceivable that group size could impact these dimensions; observation notes indicated that large classes had to spend more time taking turns with scientific equipment, for example. It is also notable that these two projects were also ones that reported occasional challenges with 21stCCLC staff not supporting students' full participation in sessions or activities, an influencing factor that is *not* necessarily related to class size.

The two larger groups also scored slightly lower in MWEE Issue Definition, which considered the level of active student participation in indoor STEM activities, which relates to the DoS dimensions discussed. For both indicators, it would take a larger dataset to confirm whether these differences were due to group size or other factors. In addition, interviewees did not express concern or difficulties that they tied to large groups classes.

There was also a pronouced difference for Youth Voice, with small groups scoring 1.0 points higher than others. However, a linear relationship with class size seems unlikely, since there was no difference in scores for this dimension between medium and large classes. **This trend was also seen in scores for Action Projects and Synthesis in MWEE scores**, two essential elements which are maximized through strong incorporation of youth direction and decision-making, which relates to Youth Voice in the DoS.

This variation observed between very small groups and the others more likely reflects that that the two projects with small classes (Projects 4 and 1) were the only ones that included opportunities for youth to share their learning outside of the project. Expressing learning outside of the class group is a significant part of a high Youth Voice score, and is also part of criteria for Action Project and Synthesis scores in the MWEE rubric. While working with a smaller group could have helped facilitate this type of student empowerment, there was no evidence in observations or interviews that indicated having a larger number of students made it impractical to achieve with these elements. Our data indicated that the score differences in these dimensions are more likely attributable to curriculum design, rather than to implementation with either a small or larger group.

After-school or Summer

There were very few differences in DoS and MWEE scores between after-school (spring) and summer projects. While after-school projects sometimes had slightly higher ratings than summer projects, differences were not consistent or strong. Only one DoS dimension and one MWEE element showed notable differences. **After-school projects' scores for Engagement with STEM were 1.1 points higher than summer projects. And all after-school projects achieved the maximum score of 8 on Issue Definition,** while summer projects' scores ranged between 5 and 6.

It is conceivable that this trend aligns with some leaders' observations that students had a "summer mindset," which sometimes made it challenging to engage them in educational STEM or watershed activities. However, because the spring projects were comprised of medium and small groups (while summer included large and small groups), these two factors are clearly conflated in our small sample, and we cannot be certain which may have influenced the results. Regarding Issue Definition in MWEEs, there is no other evidence in the interview data that time-of-year played a meaningful role in how Watershed curricula were designed in terms of defining issues and conducting background research

Moreover, interview results between these two groups reveals little evidence suggesting they had major differences in strengths and challenges. Even one after-school project described something like a "Friday mindset," which sounded quite similar to a "summer mindset," as having been a challenge in implementation. While more of the Watershed partners that we observed in the spring reported co-teaching and expertise sharing in interviews; however, one of those interviews described that the co-teaching occurred within the summer cycle, indicating that timing was not actually a factor.

We did see that comments about occasional difficulties with 21stCCLC staff participation in activities were only reported by summer projects (2 of 3 summer projects made this comment). These were also the two projects with the largest class sizes, as discussed above. It raises a question about whether the day-to-day instructional staff at 21stCCLCs tend to differ between after-school and summer offerings in their experience as educators (e.g., seasonal vs. full-time staff). If this is the case, it may be advised for Watershed partners to factor this into curriculum design.

Rural, Suburban, or Urban Setting

DoS and MWEE scores between the two urban and three suburban projects revealed quite similar scores across the board. The largest DoS differences were only around a half-point; with this small set, this was a negligible difference. The one rural project showed different patterns overall, but without multiple rural projects for comparison, these may more reflect idiosyncratic features of the Project 1 design or leaders.

However, there were several notable patterns in the interview data that suggest urban, rural, and suburban settings may have access to different assets and face different types of challenges in a few ways. **One example was students' incoming discomfort or anxiety about outdoor field experiences; evidence for this challenge was seen at both urban settings and one of the suburban settings.** There were no data from observations or interviews with the rural project that indicated any student discomfort outdoors. Because evidence indicated that discomfort or anxiety could hamper access to learning experiences, this may be an important consideration for curriculum design in urban and some suburban settings.

Another trend was that **two of the six projects articulated potential future connections between watershed education and social justice frameworks, which occurred in one urban and one suburban location.** While it may not be true across all of these settings, it suggests a potential route for integrating Watershed and 21stCCLC curricula, which may be particularly resonant at some 21stCCLC sites that are in or near urban centers.

The rural project in the study clearly leveraged assets of smaller town and the Watershed leader's familiarity with local officials. As described earlier in the report, this project convened, within 24 hours, an opportunity for students to present their findings to local engineers who worked on water quality issues. It is hard to imagine a project in an urban center, for instance, being able to do the same with the same ease and rapid turnaround. In contrast, however, **the rural project experienced greater struggles in connecting with NOAA resources and scientists,** few of which were near their town or focused on the issues of their investigation. This project needed to adapt by using non-NOAA scientists or considering videoconference solutions to connect with NOAA staff remotely.

Discussion

Pilot NOAA-21stCCLC Watershed STEM Education projects showed success across multiple measures at implementing quality educational programming in out-of-school time (OST) settings.

Implementation of projects at six diverse projects demonstrated success and wide-ranging areas of strength when viewed through multiple frameworks of best practices. From the Dimensions of Success (DoS) lens, the projects showed compelling evidence for five (of 12) dimensions, and reasonable evidence for another four of the dimensions. These scores were also generally on par with national averages, with the Watershed projects tending to excel at demonstrating Relevance, compared with the national picture.

The notable success with Relevance seemed to tie directly to the framework of best practices that form the backbone of curriculum planning among Watershed grantees – Meaningful Watershed Educational Experiences (MWEEs). Examining implementation through this lens revealed that projects excelled at framing issues and activities with a high degree of local relevance (Local Context), a best practice that emphasizes drawing local connections with students' lives, choices, and communities. Projects also incorporated multiple field experiences and indoor background research that actively engaged students and generally tied to a single driving issue for the MWEE. Following the MWEE framework seemed particularly well-suited to ensuring that STEM education was deeply contextualized and relevant to learners.

Watershed grantees were also strong in their implementations and collaborations with local 21stCCLC sites – from the strong appeal of field experiences and rapport-building with students to the use of authentic equipment and local environmental resources to enhance learning. And while all projects learned ways they could improve in the future, all felt they saw evidence of ways that students' understanding and awareness of the local watershed had been impacted, as well as forging organizational relationships that have the potential to be sustained. While the main area of challenge was the rapid project timeline, most other major challenges reflected aspects of the learning curve for Watershed organizations as they encountered distinctive attributes of OST settings – such as enrollment, expectation-setting, and attendance fluctuations.

Making the shift from a formal education B-WET curriculum to working in an informal setting requires significant adaptation that is responsive to the differences inherent in this OST setting.

A pattern drawn out of evidence in interview data and observations was that the nature of Watershed projects for OST had inherent differences when compared to traditional offerings for K-12 classrooms. Because many B-WET grantees' projects are typically designed to complement instruction within formal classroom settings, the differences in an OST setting may present new partnerships with some unexpected hurdles, depending on prior experience with creating programming for informal programs.

At the highest level, the informal Watershed projects often changed the role of the grantee – from being a supplemental provider to a larger, MWEE-based classroom curriculum (delivered by a teacher), to being the primary instructor delivering the entire MWEE curriculum. This meant the duration of the MWEE was shorter than in K-12, as it could be limited to as few as six or seven sessions, rather than a longer unit or semester-long study in a classroom. It also meant that the Watershed grantee may be the primary/only instructor of the STEM and watershed-related material; in many cases, the 21stCCLC site was not providing related educational activities between sessions. Of note, in a traditional, formal B-WET project, the classroom teacher may often take on components such as reflection or synthesis of findings. In the projects examined here, the Watershed grantee held that responsibility, which may be less common as an explicit part of their field-based lesson plans. In other words, Watershed grantees had to adapt MWEE curricula to be delivered in fewer sessions and where they held responsibility for seeing more elements of the MWEE through to completion.

In addition to this shift in role and responsibility, the OST setting also introduced differences in the context of instruction. For instance, the common challenge of fluctuating attendance at sessions impacted approaches for delivering a curriculum that was designed to build from session to session. While projects generally had a core, consistent group of students, many individual students varied from session-to-session, requiring on-the-spot assessment of prior knowledge and adaptation to ensure all could participate and understand fully.

There may be value in shifting PD models from one-way trainings that convey information to two-way, mutual sharing of expertise between Watershed and 21stCCLC partners.

The most common PD format in the pilot projects was for the Watershed grantee to provide a training to 21stCCLC staff to help familiarize them with the concepts and STEM activities planned for the MWEE; this was primarily conceived as a unidirectional training. However, evaluation revealed that there were significant benefits when projects intentionally or incidentally found opportunities for mutual learning, where the 21stCCLC partner contributed expertise and insight that enhanced or shaped the Watershed curriculum or its implementation.

The 21stCCLC partners bring a depth of understanding about the assets and the needs of their students, communities, and curricular frameworks. While the expertise sharing tended to first emerge around the immediate need of classroom management and disciplinary systems, some projects' experiences revealed broader opportunities for how collaborative curriculum planning could enhance and extend the relevance of Watershed programming. For example, two 21stCCLC partners raised the idea of reframing watershed education not only as STEM education, but highlighting its ties with social justice, a curricular priority for some 21stCCLCs.

In a couple of cases, through collaboration, 21stCCLC educators were able to take on a stronger role in extending or contributing to the Watershed curriculum. These examples did not necessarily expect 21stCCLC staff to become expert STEM educators, but enabled them to bring to the curriculum their expertise and approaches to enhance opportunities for student reflection and meaning-making. Those projects that experienced this sharing found it beneficial for themselves and for the student experience.

This approach, however, requires more time and intentional planning for both partners to work through challenges, define reasonable expectations, and learn more about the approaches of one another. Given the relatively short timeline for the pilot, it is not surprising that such deep mutual learning was not built into the plans. If it is possible in the future to encourage and provide more time for such collaboration in planning, it may benefit all of the partners and better support sustained impact within the 21stCCLCs.

Incorporating meaningful student input and youth voice proved challenging for most projects; improvement may require dedicated planning and PD about strategies for this DoS dimension.

Most projects in this study attributed the lack of youth direction and input in activities to a lack of time in the overall intervention, feeling it was difficult to incorporate student voice in just six or seven sessions. However, one project clearly demonstrated it was possible, without needing more contact-hours with students. As an outlier in this dimension, Project 1 revealed that incorporating more opportunities for youth voice did not require more time, but a different approach to planning and implementation. While having a small group size may have further eased this approach, there was no evidence that Project 1's curriculum design could not be implemented with a larger group. Given the high experience level of the Watershed educator from this project, it could also suggest that greater skill-development also is a benefit.

Looking at the strategies of Project 1 compared to others, incorporation of greater youth direction and voice may mean having a more focused driving issue in a MWEE, moving toward developing depth of student understanding about a single watershed issue, rather than covering a broad set of relevant concepts. Greater focus may relieve the pressure of "having to" cover a longer list of content. In this way, it can be seen as embracing the curricular opportunities of OST, in comparison to formal classrooms, where Watershed educators may have the freedom to do longer, deep-dive investigations rather than feeling external pressures to cover specific content items in a set amount of time.

The incorporation of youth voice, however, may also require Watershed educators to plan for flexibility within their curriculum designs. As students are given opportunities to meaningfully contribute to the direction of activities, educators must be prepared to adapt or (at least slightly) change the course of MWEE, based upon where the process of investigation and decision-making takes the students.

It is worth creating a program logic model to guide future activities, prioritizing outcomes best suited to this audience and intervention, including considering outcomes not previously articulated.

While project leaders felt that student outcomes aligned with the program's preliminary target outcome areas (understanding watershed content, conservation actions/behaviors, etc.), several other themes emerged that had not been previously articulated as goals. For example, the idea of "exposure to new places and people" was raised by many projects as an important theme. This idea is challenging to consider as an outcome, since "exposure" does not directly describe a change or demonstration by the learner. It may be useful to work toward articulating a generalized, underlying outcome that is described by this statement. One interviewee, for instance, framed it as being about students' "world getting bigger," which was distinct from an understanding of watershed relationships. This may be a starting point to articulate the nature of changes in student mindsets sparked by the program. Moreover, NOAA B-WET must consider if this is a priority outcome for the program.

Another example relates to STEM career interest. Research shows that influencing career pathways is complex, multi-faceted, and a long-term process (e.g., Lent et al., 2000). NOAA B-WET may need to consider which aspect of a career development model the program is best suited to impacting, and hone expectations accordingly. The project design of many grantees included a distinct "STEM Career" session, which related to watershed science, but did not necessarily integrate with the MWEE driving issue. As a result, STEM career awareness seemed to be an addition, rather than an integrated part of the MWEE. Identifying specific, career-related outcome priorities and supporting projects with integration may enhance implementation.

Other themes that may impact a future logic model included student comfort outdoors, which is likely best defined in terms of what can be demonstrated within the MWEE, rather than long-term behavior change. Moreover, this may affect other elements of a logic mode. A curriculum (part of a logic model activity) designed to help students work through discomfort was important to enabling student learning. Another emergent theme was students' feelings of being respected, trusted, and cared for by Watershed educators. A future logic model may want to consider which affective or social-emotional outcomes, if any, should be prioritized in project design and/or measurement.

Implications & Recommendations

NOAA's bottom-up approach – in which local groups design projects based on local expertise and partnerships – showed great promise to create highly-relevant STEM learning experiences.

Implementation evaluation of the pilot NOAA-21stCCLC Watershed STEM Education program revealed that the partnership showed great promise in providing high-quality STEM education experiences that particularly excel at demonstrating relevance and leveraging local, place-based resources to expand learning and opportunity for high-need students in afterschool and summer settings. The Relevance dimension in the DoS framework – connecting STEM learning to real life and personal experience – appears to be the most challenging across the national network of informal programs that use this metric, while the NOAA-21stCCLC projects tended to show clear evidence of these connections. Further, students' enthusiasm about field experiences and educators' observations that students' worlds "got bigger" with these experiences point to the power of the highly-relevant experiences created by these projects.

We attribute this success, at least partially, to the distinctive approach taken to implementation within the NOAA-21stCCLC pilot program. This pilot relied on its Watershed education providers to create locally-relevant projects that would be meaningful for youth. They did this by leveraging local and regional assets, expertise, and curriculum designs that centered on issues and topics that meaningfully affect the lives of their youth participants. This approach was grounded in the educational best practices of watershed education, as articulated in NOAA's MWEE framework. While it resulted in wider project-level variation in curriculum and activities than would be seen in a top-down curriculum dissemination approach (a potential challenge for measurement), it appeared far better suited to the goals of the NOAA-21stCCLC partnership and evaluation evidence indicated that it was largely successful at demonstrating educational best practices, despite local variation.

In a bottom-up approach, time for planning and relationship-building is essential. A cross-cutting challenge was achieving a project's vision within the rapid timeline of the program.

The most consistent theme in interviews with local implementation partners was the challenge of the rapid timeline of the projects – from proposal to award to implementation. This timeline impacted decisions and actions at each of the studied projects and was cited as a factor at every stage of the process – from partnership-building to curriculum design to curriculum implementation. While some degree of "learning curve" may be anticipated in a pilot project, there were many attributes of these comments that suggested any new development process in this model would face similar challenges if a more extended timeline for project development and planning were not possible. Because of the locally-based, partnership-focused approach to the NOAA-21stCCLC projects, a reasonable amount of up-front time is necessary in order to support implementation.

Because the issue of timing, relative to the funding opportunity, was so cross-cutting, we use it to further organize recommendations in the following pages. As we discuss recommendations regarding local planning, curriculum design, and curriculum implementation for future iterations of the NOAA-21stCCLC Watershed STEM Education program, we organize those recommendations into two sub-groups: recommended adjustments that could be achieved with a longer overall timeline, and the more minimal adjustments that might be made within the constraints of timing identical to the 2017 pilot.

Recommendations

Planning: Mutual Learning & Integration

The Watershed and 21stCCLC partners in the pilot built strong and, in some cases, lasting partnerships. In examining the range of collaboration approaches used, the implementation evaluation revealed that there could be broad-based benefit from placing a greater emphasis on expertise sharing and mutual learning between local Watershed partners and 21stCCLC sites. This approach intentionally recognizes the expertise of both sides of the partnership and could maximize the value achieved through the locally-based project design. Moreover, it may help create a stronger framework to achieve extended impact, via the greater likelihood of long-term organizational relationships and newly developed capacities of educators on both sides.

Recommendations for a Short Timeline:

- RFP: Recommend that Watershed partners include opportunities for expertise sharing in planning or PD, including (at minimum) opportunities for 21stCCLC staff to share insights about their community, guiding principles, and approach to behavior management. Efforts at more advanced collaboration could be encouraged, but a requirement may not be feasible for all locations on a short timeline.

- Resources: Provide case studies and examples of ways that Watershed partners incorporated expertise-sharing with 21stCCLC partners in Watershed project implementation. Draw from examples in the pilot program, where this approach emerged and was successful.

Additional Recommendations for Longer Timeline:

- RFP: Require proposals to demonstrate plans for integration between Watershed and 21stCCLC partners, including presenting a plan for a collaborative PD model, connections between the Watershed and 21stCCLC curricula, and/or co-teaching. This may benefit from a longer timeline in the proposal preparation stage, if possible.

- Timeline: Incorporate a longer timeline between award notification and implementation start to allow for curriculum integration, planning, and PD activities.

Curriculum Design: From K-12 to Informal

Although implementation was largely successful, evaluation revealed some areas of difficulty faced when adapting a curriculum designed for K-12 classrooms to be used in after-school settings, due to differences in attendance, student mindset, and lack of supporting instruction from a classroom teacher. The use of existing curriculum allowed sites to ramp up projects quickly; however, this did not always result in fullest use of the opportunities afforded by the informal, after-school setting. We suggest the RFP move away from the idea of "adapting" curriculum, and consider framing these projects as opportunities to apply the most impactful MWEE activities in new ways for after-school settings. For example, including deeper exploration of narrower questions, with standards-based pressures alleviated and opportunities to maximize youth empowerment prioritized.

Recommendations for a Short Timeline:

- RFP: Modify language and review criteria to emphasize the need to be responsive to the after-school/summer environment and characteristics.

- Resources: Provide case studies and examples of existing informal Watershed projects, drawing attention to how and why they differ from those for K-12 settings.

- Design: Issue investigations may be better off designed with a "string of pearls" approach, with daily investigations that have a cumulative benefit, but can be beneficial if experienced as one-off sessions, as well.

Additional Recommendations for Longer Timeline:

- Support: Provide training in conjunction with the RFP to increase Watershed partners' familiarity with attributes of OST settings, best practices, and potential impact on curriculum design. This would include fundamentals of an OST setting and students and discussing examples of MWEEs in the OST setting.

- Collaboration: With a longer planning period, collaboration with the local 21stCCLC could allow for critical vetting and review of curriculum design with an eye to feasibility, student interest, and integration with 21stCCLC curriculum.

Implementation: Practicing Best Practices

On the whole, Watershed educators were on par with national averages in demonstrating DoS best practices in their informal STEM activities and excelled at particular areas, such as Relevance. There were, however, some dimensions that showed potential for improvement, which may be supported with further PD for grantees. For example, the DoS best practices are not only useful for informing curriculum design, but it may be valuable to also consider how they might structure PD for on-the-ground educators. The DoS scores are heavily influenced by the ways in which a facilitator implements activities. From this lens, it may be valuable to support these educators to reflect on their own practice and consider facilitation strategies that may be more and less effective to create exceptional learning experiences for youth.

Recommendations for a Short Timeline:

- Grantee PD: Offer support targeted to serve day-to-day educators from Watershed and/or 21stCCLC partners. Such training could be grounded in the DoS framework, but would focus on how activity facilitators can embody the best practices.

- Resources: Provide exemplar activity/lesson plans, designed with the DoS framework in mind. Annotate these facilitation guides to highlight relationships between a facilitation strategy and a specific dimension. Ask Watershed partners to share and annotate their most successful plans for public use.

Additional Recommendations for Longer Timeline:

- Grantee PD: Consider working with Y4Y to situate their trainings in conjunction with implementation timelines. Offering "just-in-time" support could allow for educators to incorporate reflection from actual experiences and challenges within their projects. If possible, draw links between DoS best practices and core competencies from the environmental education field (e.g., MWEE, NAAEE).

- Grantee PD: Look for a range of opportunities and formats to offer targeted trainings to grantees to maximize opportunities and formats for professional learning. These may include workshops associated with existing national or regional conferences, synchronous interactive webinar formats, and posting links to recorded sessions (one-way training models).

Outcome Planning & Evaluation Priorities

Recommendations for Outcome Planning:

- Create a program logic model, based on lessons learned from the pilot. This model would use evidence of the critical activities and practices for the NOAA-21stCCLC partnership model, as well as identify the planned priorities for providing support and training to grantees.

- Identify a focused set of outcome statements that reflect the audiences and outcomes that are 1) the highest priority for this partnership, and 2) best aligned with the activities to be implemented by the Watershed and 21stCCLC partners. Use this work to help identify a set of priority evaluation questions that will further aid improvement in the next phase.

Methodological Considerations for Evaluation:

- The DoS observational method is a useful and powerful tool, which provides rich qualitative and quantitative data about projects. It can also be a budget-intensive tool when data are collected by an external evaluator. As seen in this pilot, the ability to explore relationships in data patterns is limited with a small sample. Therefore, it may be important to consider how DoS observations might be used to complement other methods in a larger evaluation plan.

- The MWEE observational tool worked reasonably well as a pilot, although it needs further testing to be a more robust tool. It had similar limitations to the DoS, with an added question of how well a sample of sessions represent the holistic nature of a MWEE. An alternative to refining the observational tool would be adapting it into a self-assessment system. This adaptation would need to address potential self-reporting bias, but it could allow for more cost-effective data collection, a holistic perspective, and include the entire population of projects.

- If an evaluation of youth impacts is pursued, it will be critical to identify priority outcomes. Any youth-focused evaluation plan will also need to consider the range of what is already being collected at the local level to ensure that youth are not over-tested. Further, if survey or interview data are desired from 10 or more subjects, the program will need to obtain OMB Paperwork Reduction Act clearance. Sufficient time will need to be built into the timeline for this process to occur prior to data gathering.

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Appendix A: Student Demographic Profiles

Table 8. Demographic profiles of all students involved in all project activities (observed or not), as reported by grantees in final grant reports

Project ID	Grade Level	Student Gender	Student Ethnicity / Race	Title 1 Schools
Project 1	40% ES 60% MS	40% Female 60% Male	76% White 10% Black/African American 8% Hispanic/Latino/Spanish 4% Multi-racial 2% American Indian/Alaska Native	40% Title 1[1]
Project 2	50% ES 50% MS	38% Female 62% Male	70% Black/African American 10% Hispanic/Latino/Spanish 10% White 10% Multi-racial	100% Title 1
Project 3	100% ES	50% Female 50% Male	65% White 20% Hispanic/Latino/Spanish 15% Black/African American	100% Title 1
Project 4	100% MS	87% Female 13% Male	60% White 27% Black/African American 13% Hispanic/Latino/Spanish	100% Title 1
Project 5	76% ES 24% MS	66% Female 34% Male	67% Hispanic/Latino/Spanish 33% Black/African American	67% Title 1[2]
Project 6	100% MS	45% Female 55% Male	100% Hispanic/Latino/Spanish	80% Title 1[3]

[1] This is the free/reduced lunch rate of the school where the 21stCCLC after-school and summer projects were held; all students in the project were identified as "special populations" (e.g., had IEPs, were low-income, were ELL, etc.)

[2] Both schools that hosted the 21stCCLC summer camps are Title 1 schools. One summer camp's attendees likely came from that school; the other camp's attendees were drawn from various schools in the system. The percentage is, therefore, an estimate.

[3] The other 20% was reported as unknown.

Appendix B: Pilot MWEE Observational Rubric

MWEE OBSERVATION RUBRIC
Final Version: 09/01/2017

BACKGROUND: About MWEEs and this Rubric

MWEEs are defined by a number of essential elements, some of which relate to student experiences, some of which relate to teacher PD, and some of which relate to contextual support. For the purposes of this observational data collection, we are focusing on six of the essential elements – four focused on student experiences and two focused on contextual support. On the next page, each element is listed with a brief definition.

There are a few fundamental challenges with developing an observational rubric for scoring implementation of MWEEs in practice. **First, each essential element is multi-faceted.** While an element may have a simple-sounding title, the definitions clearly highlight that quality implementation consists of a suite of critical characteristics that are interrelated, but not the same. This is mainly true for the Student Experience elements. The rubric needed to provide a way of examining evidence of each characteristic that contributes to the definition of an essential element. To address this: the Student Experience Essential Elements are broken down into two distinct characteristics, on which quality is scored, which will be aggregated into a total score for that element.

Second, MWEEs are multi-day programs, with different days placing greater emphasis on different essential elements. This is most clear with the four student experience elements (1.1 – 1.4); typically, different days or phases of a MWEE program will focus on background research, field activities, or synthesis, for example. However, while a program-day may focus more heavily on one essential element, it does not stand in isolation from the others. Each builds upon and reinforces the others, particularly as the program progresses. The rubric needed to provide a way for considering how each element is exhibited during focal and non-focal days to demonstrate this interconnectedness. To address this: the rubric will not be used to score a single observation. Instead, it will be used to score evidence across three observations, which are purposefully sampled to represent a range of focal activities. Most characteristics are anticipated to have some evidence revealed across sessions. A few characteristics, however, require input from the program planning documents (e.g., the number of field experiences planned). Review of such documents is incorporated into the scoring, but is a different and more limited analytical approach than observational data. This limitation is acknowledged, and gaps will be addressed through other study data (e.g., interviews).

Third, observational scoring systems require time to calibrate and refine. This is a pilot effort and is not part of a large-scale instrumentation project. The data that result will be informative for program planning and reflection, but the scores should be considered cautiously. However, the process of generating and organizing observational data that supports the score under each characteristic will allow for a second refinement of the rubric at the end of the project. The rubric will be far stronger after its language and criteria can be calibrated against actual collected observations and programs, reflecting nuance and complication of how behaviors and plans manifest in a real-world setting.

NOAA B-WET MWEE Essential Elements: Definitions

1.1 Issue Definition and Background Research
Students focus on an environmental question, problem, or issue requiring background research and investigation. They learn more about the issue through classroom instruction, the collection of data, conducting experiments, talking to experts and reviewing credible publications. This process should be age appropriate with practices growing in complexity and sophistication across the grades, starting with educator guided investigation and progressing to student-led inquiry.

1.2 Outdoor Field Activities
Students participate in multiple outdoor field activities sufficient to collect the data or make observations required for answering the research questions and informing student actions, or as part of the issue definition and background research. Students should be actively involved in planning the investigation, taking measurements, or constructing the project within appropriate safety guidelines, with teachers providing instruction on methods and procedures, data collection protocols, and proper use of equipment as needed. These activities can take place off-site and/or on the school grounds.

1.3 Stewardship Action Projects
Students participate in an age appropriate project during which they take action to address environmental issues at the personal or societal level. Participants in B-WET MWEE activities should understand they have control over the outcome of environmental issues, be encouraged to identify actions to address these issues and understand the value of those actions. Examples of stewardship activities include:
- Watershed Restoration or Protection (e.g., create schoolyard habitat, planting trees or grasses, invasive species removal, community cleanup, stormwater management)[1]
- Everyday Choices (e.g., reduce/reuse/recycle, composting, energy conservation, water conservation)
- Community Engagement (e.g., presentations, social media, event-organizing, messaging at community events/fairs/festivals, mentoring, PSAs, flyers, posters)
- Civic Action (e.g., town meetings, voting, writing elected officials/decision makers, advocating for policy change)

1.4 Synthesis and Conclusions
Students analyze and evaluate the results of projects and investigations. Students synthesize and communicate results and conclusions to an external audience such as other classrooms, schools, parents, or the community.

2.3 Use of the Local Context for Learning
The local community and environment should be viewed as a primary resource for student MWEEs. Place-based education promotes learning that is rooted in the unique history, environment, culture, economy, literature, and art of a students' schoolyard, neighborhood, town or community, and thus offering students and teachers the opportunity to explore how individual and collective decisions impact their immediate surroundings. Once a firm connection to their local environment is made, students are better positioned to expand their thinking to recognize the far-reaching implications of the decisions they make to the larger national and global environment.

2.5 Includes NOAA Assets, Including Personnel and Resources
NOAA has a wealth of applicable products and services as well as a cadre of scientific and professional experts that can heighten the impact of environmental instruction both in the classroom and in the field. Environmental professionals can also serve as important role models for career choices and stewardship.

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[1] While **monitoring** is a good science practice, it alone doesn't constitute a stewardship activity. It could be part of a stewardship activity if the data is being used to inform resource managers or used to communicate a stewardship issue.

MWEE Essential Element 1.1: ISSUE[2] DEFINITION AND BACKGROUND RESEARCH

1.1.1: Articulation of the Issue

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
An environmental[3] question, phenomenon, problem, issue, or driving question is clearly articulated and referred to.	**In Observed Sessions:** Neither the facilitator nor the students ever mention an overarching driving question, phenomenon, problem, or issue in any observed sessions. OR The question, phenomenon, problem, or issue identified does not relate to the environment.	**In Observed Sessions:** The facilitator and/or students identify a driving question, phenomenon, problem, or issue for each session, but those are not related back to a single, overarching driving issue. OR The leaders articulate something as their "overarching issue" during <u>one</u> observed session, but it is not referenced again in any other observed sessions. AND The question, phenomenon, problem, or issue clearly relates to the environment.	**In Observed Sessions:** The facilitator and/or students clearly refer to **a single, overarching** driving question, phenomenon, problem, or issue during <u>two</u> sessions observed. AND The question, phenomenon, problem, or issue clearly relates to the environment.	**In Observed Sessions:** The facilitator and/or students clearly and consistently refer to **a single, overarching** driving question, phenomenon, problem, or issue during <u>each</u> observed session. (i.e., the same single "issue" is verbally referenced within each session observed) AND The question, phenomenon, problem, or issue clearly relates to the environment.

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[2] The term "Issue" for this element includes "issues, problems, and phenomena." A phenomenon is a process or system that students are curious about, but not necessarily a problem or issue, such as a shad migration or the timing of jellyfish appearing in a tributary. A problem could be runoff pollution or something that is clearly detrimental. An issue could be where to build a new building, whether or not a school should install a rain garden, how to monitor stream health, etc. An issue could be a problem, but it doesn't have to be.

[3] The term "environmental" or "related to the environment" is defined based on common definitions of environmental science as a field (such as NCES). In this case, to be an environmental problem/phenomenon/issue/question, it will: apply biological, chemical, and/or physical principles to understanding some aspect of the physical environment and/or the interaction between human society and the natural environment.

1.1.2: Student Engagement in Indoor Background Research or Investigations

	Evidence Absent	**Inconsistent Evidence**	**Reasonable Evidence**	**Compelling Evidence**
	1	2	3	4
Students are actively involved in conducting background research focused on understanding the driving issue and in investigation of supporting questions for further investigation. *NOTE: for the purpose of this rubric, this dimension looks only at INDOOR experiences, whether they are background research or investigations. OUTDOOR experiences are examined in a subsequent dimension.*	**In Observed Indoor Activities:** Students take a passive role in the background research or investigation activities, including adult-to-student transmission of information (e.g., lectures or talks explaining things) or watching as adults carry out activities, use tools, or perform demonstrations. (Hands off)	**In Observed Indoor Activities:** Students participate in the background research or investigation activities, but <u>active student participation is limited</u> (i.e., more than half of indoor observed time is spent with adults lecturing, explaining, or demonstrating, rather than active student participation). (Partially Hands-on) OR Neither facilitator nor students articulate any connections between the **activities** and the overarching driving issue or supporting questions during observed sessions.	**In Observed Indoor Activities:** Students take an active role in the background research or investigation activities, with more than half of observed time spent with students actively participating in things like: -conducting observations -interviewing experts -reviewing credible publications -conducting experiments -using tools (Hands-on) AND Facilitator or students make clear connections between most observed **activities** and the overarching driving issue OR supporting questions/issues during observed sessions.	**In Observed Indoor Activities:** Students take an active role in the background research or investigation activities, with more than half of observed time spent with students actively participating (see left). (Hands-on) AND Facilitator or students make clear connections between all observed **activities** and the overarching driving issue OR supporting questions/issues during observed sessions. AND <u>In at least one</u> observed session, facilitator or students refer back to / connects with things learned in previous sessions (whether or not those sessions were observed).

Total Possible Score for Issue Definition: 2-8

MWEE Essential Element 1.2: OUTDOOR FIELD EXPERIENCES

1.2.1: Student Outdoor Experiences

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Students participate in multiple outdoor field experiences that are related to the driving issue of study. *NOTE: for the purpose of this rubric, this dimension looks at all OUTDOOR experiences, whether they are background research or investigations.* *The only exception is if a portion of a session uses the outdoors because it is a convenient or pleasant location for activities. In this case, the activity should be included in analysis for the rubric in Section 1.1.2, and reasoning included in evidence sheet.*	Students do not go outside for field experiences during any sessions, observed or planned. OR Students go outside for one field experience (observed), but it is <u>not</u> made clear by facilitator or students how **the field activities** relate to the overarching question, issue, problem, or phenomenon of focus OR to the day's supporting issue/question of focus.	Students go outside for only one field experience, observed or planned. OR Students go outside for multiple field experiences (observed or planned); BUT during observed field session(s), neither facilitator nor students ever make a connection between **the field activities** and the driving question, issue, problem, or phenomenon of focus OR the day's supporting issue/question of focus.	Students go outside for multiple field experiences, observed or planned. AND During <u>at least one</u> observed field experience, the facilitator or students make a connection between **the field activities** and the driving question, issue, problem, or phenomenon of focus OR the day's supporting issue/question of focus.	Students go outside for multiple field experiences, observed or planned. AND <u>In all</u> observed field experiences, the facilitator or students make a connection between **the field activities** and the driving question, issue, problem, or phenomenon of focus OR the day's supporting issue/question of focus. AND The goal and activities of all unobserved field experiences are judged to directly and unambiguously serve the driving question, issue, problem, or phenomenon.

1.2.2: Active Involvement in Investigation

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Students are actively involved in activities that occur during the outdoor field experience(s), including background research and/or investigations.	**In Observed Field Activities:** Students take a passive role in the experience, including watching as adults carry out activities, use tools, or perform demonstrations. (Hands off)	**In Observed Field Activities:** Students participate in some parts of the experience, but <u>active student participation is limited</u> (i.e., more than half of observed field time is spent with adults lecturing, explaining, or demonstrating, rather than active student participation). (Partially Hands-on) **OR** Few, if any, observed field activities make strong use of the assets provided by the field site; they incorporate activities that could not be carried out as authentically in a classroom	**In Observed Field Activities:** Students take an active role in the experience, with more than half of observed field time spent with students actively using tools, carrying out activities, and/or interacting with the environment. (Hands-on) AND Most observed field activities make strong use of the assets provided by the field site; they incorporate activities that could not be carried out as authentically in a classroom.	**In Observed Field Activities:** Students take an active role in the experience, with more than half of observed field time spent with students actively using tools, carrying out activities, and/or interacting with the environment. (Hands-on) AND All observed field activities make strong use of the assets provided by the field site; they incorporate activities that could not be carried out as authentically in a classroom. AND During at least one observed field session, facilitator or students refer to / connect with concepts learned or activities conducted in previous sessions (whether or not those sessions were observed).

Total Possible Score for Field Experience: 2-8

MWEE Essential Element 1.3: STEWARDSHIP ACTION PROJECTS

1.3.1: Participation in Action Project

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Students participate in a relevant stewardship action project[4].	Students do not participate in a stewardship action project at all during the program (planned or observed).	Students do participate in a stewardship action project (planned or observed). AND *If observing an action project:* During the implementation, planning, or preparation for the stewardship action project, facilitators or students do not make clear reference to the relationship between the project and the larger concepts from earlier phases of the MWEE. OR *If not observing:* Planned activities are not clearly related to the larger concepts from the issue definition phase.	Students do participate in a stewardship action project (planned or observed). AND *If observing an action project:* During the implementation, planning, or preparation for the stewardship action project, facilitators or students make clear reference and connection to the larger concepts from earlier phases of the MWEE. OR *If not observing:* Some connection can be inferred between planned activities for the stewardship action project and the larger concepts from the issue definition phase.	Students do participate in a stewardship action project (planned or observed). AND *If observing an action project:* During the implementation, planning, or preparation for the stewardship action project, facilitators or students make clear reference and connection to the larger concepts from earlier phases of the MWEE. OR *If not observing:* Some connection can be inferred between planned activities for the stewardship action project and the larger concepts from the issue definition phase. AND Facilitators or students talk about ways that students could continue to help with the issue, beyond the action project.

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[4] an age appropriate project during which they take action to address environmental issues at the personal or societal level. May include: watershed restoration or protection (including cleanups), related to everyday choices (use/recycling, conservation, composting, etc.), community engagement (creation of materials for engagement of others), or civic action.

1.3.2: Choice and Design of Projects

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Students are actively involved in choosing and designing the stewardship action project.	Students do not participate in a stewardship action project at all during the program (planned or observed). OR Students participate in a stewardship action project, but are not involved in any choosing or designing of the project (observed or planned).	*Based on observational data or planned activities:* Students are involved in EITHER choosing OR designing the stewardship action project, but not both.	*Based on observational data or planned activities:* Students are involved in choosing AND designing of a stewardship action project. AND The adults, rather than students, took the leading role in choosing (i.e., presented options for students to choose from) and/or designing the action project (i.e., presenting a set protocol or design to follow or match for the project).	*Based on observational data or planned activities:* Students are involved in choosing AND designing a stewardship action project. AND There is evidence from any observations that the students took the <u>leading role</u> in choosing (i.e., came up with at least one project idea themselves) and/or designing the action project (i.e., within a project direction, took the lead in designing the solution or plan they would follow).

Total Possible Score for Action Project 2-8

MWEE Essential Element 1.4: SYNTHESIS AND CONCLUSIONS

1.4.1: Time for Synthesis

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Students have dedicated program time to synthesize, analyze, and draw conclusions from their program activities.	Facilitators do not provide any <u>dedicated time</u> during observed sessions for discussion, analysis, or drawing conclusions from the research activities students participated in during the program. (Note: Synthesis time can be focused on research activities conducted in a previous session.)

NOTE: "Research activities" in this rubric include both background research and investigation activities. | **In at least <u>one</u> observed session:** Facilitators provide <u>dedicated time</u> for discussion, analysis, or drawing conclusions from the research activities students participated in during the program. (Note: Synthesis time can be focused on research activities conducted in a previous session.)

AND

Synthesis activities are mainly adult-guided, rather than students doing the work of analysis or forming conclusions. (e.g., Students are mainly agreeing with conclusions/statements provided by adults, rather than generating their own ideas.)
(Minds-off) | **In <u>one</u> observed session:** Facilitators provide <u>dedicated time</u> for discussion, analysis, or drawing conclusions from the research activities students participated in during the program. (Note: Synthesis time can be focused on research activities conducted in a previous session.)

AND

Synthesis activities ask students to do the cognitive work of analysis or forming conclusions, at an age-appropriate level. (e.g., students are generating conclusions, claims, or implications related to activities)
(Minds-on) | **In 2 or more observed sessions:** Facilitators provide <u>dedicated time</u> for discussion, analysis, or drawing conclusions from the research activities students participated in during the program. (Note: Synthesis time can be focused on research activities conducted in a previous session.)

AND

Synthesis activities ask students to do the cognitive work of analysis or forming conclusions, at an age-appropriate level. (e.g., students are generating conclusions, claims, or implications related to activities)
(Minds-on) |

1.4.2: Communication of Results

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Students communicate results and conclusions to an audience beyond their group.	During observed sessions, no reference is made to how, where, or to whom the results of the investigations will be shared.	During at least one observed session, some reference is made to students sharing results or conclusions. However, references are vague, non-specific, and with no evident plan or awareness among student as to where results of their work would be shared.	During at least one observed session, clear reference is made to students sharing results or conclusions with <u>other members of their group</u>. AND References indicate sufficient specificity to be clear that it will happen.	During at least one observed session, clear reference is made to students sharing results or conclusions with <u>stakeholder audiences outside of the group</u> – such as other student groups, parents, community events, nonprofits, conferences, summits. AND References indicate sufficient specificity to be clear that it will happen.

Total Possible Score for Synthesis and Conclusions: 2-8

MWEE Supporting Practice 2.3: LOCAL CONTEXT

2.3 Local Context

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
Activities and projects are clearly linked to and provide opportunities to explore a <u>locally-relevant</u> question, issue, problem, or phenomenon.	The overall driving issue explored by the overall MWEE program does not have a clear link to a locally relevant issue. OR Very few observed activities relate to a locally-relevant issue, question, problem, or phenomenon.	The overall driving issue explored by the overall MWEE program has a clear link to a locally relevant issue. AND The majority of activities observed, as enacted, only peripherally relate to a locally-relevant issue, question, problem, or phenomenon. (For example: an activity takes place in a local environment, but it is focused on a broader science concept, without a clear connection to the local issue.) AND/OR Facilitators and/or students do not talk about specific, local impacts of specific individual or collective actions (positive or negative) in any sessions observed.	The overall driving issue explored by the overall MWEE program has a clear link to a locally relevant issue. AND The majority of activities observed, as enacted, support students in building understanding that is directly relevant to a locally-relevant issue, question, problem, or phenomenon. (The majority of activity time across all sessions together) AND In one observed session, facilitators and/or students talk about specific, local impacts of specific individual or collective actions (positive or negative).	The overall driving issue explored by the overall MWEE program has a clear link to a locally relevant issue. AND The majority of activities observed, as enacted, support students in building understanding that is directly relevant to a locally-relevant issue, question, problem, or phenomenon. (The majority of activity time across all sessions together) AND In multiple observed sessions, facilitators and/or students talk about specific, local impacts of specific individual or collective actions (positive or negative).

Total Possible Score for Local Context: 1-4

NOAA MWEE Best Practice 2.5: USE OF NOAA RESOURCES

2.5 NOAA Resources

	Evidence Absent	Inconsistent Evidence	Reasonable Evidence	Compelling Evidence
	1	2	3	4
NOAA products, services, and/or experts are used within program activities.	Across observed or planned sessions, no NOAA resources or experts/scientists are used. (NO NOAA)	Across observed or planned sessions, at least one NOAA resource or expert/scientist is used, but it is not identified (in its connection to NOAA) by facilitators or in any materials given to students. (Unidentified NOAA resource) OR No NOAA resource(s) used has a relationship to the driving issue.	Across observed or planned sessions, at least one NOAA resource, is used and it is identified by name (in its connection to NOAA). HOWEVER, none of the NOAA resource(s) was a NOAA expert or scientist participating (observed or planned). (Identified non-human NOAA resource) AND At least one NOAA resource used has some relationship to the driving issue/question.	Across observed or planned sessions, at least one NOAA resource is used and it is identified by name (in its connection to NOAA). AND At least one of the NOAA resource(s) used is a NOAA expert or scientist participating in at least one session (remotely or in person; observed or planned). (Includes identified human NOAA resource) AND All NOAA resource(s) used has some relationship to the driving issue/question.

NOAA resources include:
- Information from NOAA websites or reports (e.g., NOAA, Marine Debris Program, or NERRS education webpages, NOAA Climate Portal, NOAA FishWatch)
- Data sets collected by and accessible through NOAA (e.g., NOAA View, NOAA Digital Coast, NOAA Buoys, Real-time Tides and Currents, NERRS SWMP data)
- NOAA experts (e.g., scientist, educator, Sea Grant staff member, policy expert)
- NOAA curricula and education programs (e.g., Data in the Classroom, Estuaries 101 curriculum, Ocean Exploration)
- NOAA labs or facilities (e.g., Northeast Fisheries Science Center Milford Lab, NOAA Chesapeake Bay Office Oxford Lab, Southeast Fisheries Science Center in Pascagoula MS, NOAA Science On a Sphere sites, Sea Grant floating classroom vessel)
- NOAA National Marine Sanctuary
- NOAA National Estuarine Research Reserve

Total Possible Score for NOAA Resources: 1-4