Appendix A: Descriptions for the Nine Summer STEM Programs.

Island Explorers: A science-focused program that aims to help youth develop expertise on one species found in the local ecosystem by reading and writing about related content for up to an hour per day; undertaking data collection and analysis tasks to learn about the local ecosystem and how to communicate scientific data; developing vocabulary about the local ecosystem; using art to learn and communicate information; and publishing a book illustrating important elements of the species being studied. Located in both the classroom and local ecosystem. 27 students who are rising 6th graders. Youth spend the morning in more academically-oriented sessions in a classroom setting, while afternoon sessions involved STEM-oriented enrichment sessions taking place outside (the program was associated with Outward Bound) with an emphasis on exploration of the local ecosystem.

The Ecosphere: A science-focused program that aims to help youth to explore the marine life of Narragansett Bay. Efforts were undertaken to build youth content knowledge in the areas of ecosystem preservation, marine biology, and water quality, and related skills, such as questioning, showing initiative, data collection, measuring, maintaining an ecosystem, and analyzing water samples. Located in a classroom setting, shoreline, and science education center. 27 youth who are rising 6th to 9th graders. Youth attended programming in a classroom at an area middle school and in a field-based setting on alternating days. Field-based settings included a science education center at a community-based organization and field trips to sites in the community related to the program's focus.

Zoology Partners: A science-focused program that aims to support youth's development of content knowledge related to the issue of endangered species, including how species become endangered, processes for monitoring ecosystem viability and population levels, solutions to prevent species from becoming endangered, and approaches to reviving populations that are currently endangered. Located in the classroom as well as zoos, parks, and other natural areas. 25 youth who are rising 6th to 9th graders. Youth attended programming in a classroom at an area middle school and in a field-based setting on alternating days. Field-based settings included a local zoo and field trips to sites in the community related to the program's focus.

Marine Investigators: A science-focused program that aims to provide youth with opportunities to learn about and experience Narragansett Bay; examine human impacts on the local ecosystem, including how the geography of the Bay helped influence human history and how the history of humans along the shoreline has impacted the Bay, and begin the process of cultivating a sense of stewardship among participating youth for caring for and protecting the Bay in the future. Located in the classroom, shoreline along the bay, ship on the bay, and various field locations associated with bay health. 19 youth who are rising 7th to 9th graders. Youth attended programming in a classroom at an area middle school and in a field-based setting on alternating days. Field-based settings included the local bay shoreline, a voyage on a marine education ship researching in the Bay, and field trips to sites in the community related to the program's focus. During the span of the program, youth had the opportunity to participate in both a water quality research study.

Comunidad de Aprendizaje: A STEM-focused program that aims to help youth improve basic skills in mathematics and develop an interest in STEM content and entrepreneurship. Primarily in the classroom setting. 33 students who are rising 5th to 8th graders. Morning sessions are characterized by direct instruction in mathematics for individual grade levels and mixed grade level afternoon enrichment sessions in either robotics or dance. The direct instruction component of the programs was organized around a theme of promoting entrepreneurship with the goal of helping participating youth better see the relevance of mathematics to future career goals and opportunities.

Jefferson House: A STEM-focused program that aims to support youth's development of basic math skills, the program was primarily focused on helping youth develop problem-solving, self-improvement, and critical thinking skills. Located in a classroom. 11 youth who are rising 7th graders. The youth spent the morning in more academically-oriented sessions in a classroom setting focusing on basic skill development, while afternoon sessions involved STEM-oriented enrichment sessions involving media, art, and nutrition. Enrichment offerings varied by day, with math sessions occurring twice per week, alternating with academically oriented sessions in the am that were oriented at supporting skill development in English/language arts.

Uptown Architecture: An engineering-focused program that aims to support youth's participation in a process to design and build an outdoor learning space for use at the middle school where the program was housed. A key focus of the program was to provide youth with the opportunity to use design thinking as a problem-solving tool and have the experience of affecting their community positively through the design/build process. Located in a classroom, building shop, and various field locations. 18 youth who were rising 6th to 9th graders. Youth attended programming in a classroom at an area middle school and in a building shop located at a community-based organization on alternating days, while also taking field trips to locations associated with the program's overall theme.

Building Mania: An engineering-focused program that aims to provide youth with the opportunity to experiment with designing and using simple machines. A goal of the program is to have youth engage in the engineering design process by determining a need, brainstorming possible designs, selecting a design, planning and drawing out the design, creating and testing and revising it, and producing a final machine. Located in the classroom, design labs, and other local locations. 24 youth who are rising 6th to 9th graders. Youth attended programming in a classroom at an area middle school and a field-based setting on alternating days. Field-based settings included a design lab at a community-based organization and field trips to sites in the community related to the program's focus.

Adventures in Mathematics: A mathematics-focused program that aims to help youth to develop the basic math skills and prevent summer learning loss among participating youth through direct instruction and participation in math-related games. Located primarily in the classroom. 20 youth who are rising 8th to 10th graders. Youth participated in direct instructions in mathematics and math-related games in small groups. Program content was aligned with the state's standards in mathematics.

Appendix B: Alignment of the adapted STEM-PQA measure to the aspects of work with data.

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| Aspect of Work With Data | Code from the adapted STEM-PQA | Code from the adapted STEM-PQA Description |
| Asking questions or defining problems | Prediction | Staff ask youth to make predictions, conjectures, or hypotheses |
| Making observations | Classification | Staff support youth in using classification and abstraction, linking concrete examples to principles, laws, categories, and formulas |
| Generating data | Measurement  Precision | Staff support youth in collecting data or measuring  Staff highlight value of precision and accuracy in measuring, observing, recording, or calculating |
| Modeling data | Model | Staff support youth in using a simulation, experiment, or model to answer questions, explore solutions, or test hypotheses |
| Interpreting and communicating findings | Use of symbols  Analysis | Staff support youth in using a simulation, experiment, or model to answer questions, explore solutions, or test hypotheses  Staff support youth in conveying STEM concepts through symbols, models, or other nonverbal language |