TABLE 1

The D-STEM Rubric with elements of effective STEM learning environments.

Element	Description
STEM integration	The problems or context require students to use knowledge and skills from multiple STEM disciplines.
Realistic problems	Problems are interdisciplinary and grounded in the real world.
Collaborative nature of STEM	There is collaboration among students in which members have roles and responsibilities (i.e., teamwork).
Personal experience	Problems or tasks are linked to students' lives and tap into or elicit their interests.
Multiple representations	The problems or context support the use of multiple representations. Representational models include symbols, visual diagrams, and verbal statements.
Community-industry engagement	Content is linked with industry, the community, or families in a variety of ways (e.g., expert talks, joint works, using business or community contexts).

TABLE 2

Participants' responses compared with D-STEM Rubric elements.

Element	Level of indication		
	Strong	Some	None
STEM integration	P2, P8	P4, P7, P9, P12	P1, P3, P5, P6, P10, P11, P13, P14, P15
Realistic problems	P2, P8, P12	P1, P4, P7, P9	P3, P5, P6, P7, P10, P11, P13, P14, P15
Collaborative nature of STEM	P8	P1, P2, P3, P4, P5, P7, P10, P11, P12, P13, P14	P6, P7, P9, P15
Personal experience	P2, P8, P9, P12	P4, P7	P1, P3, P5, P6, P10, P11, P13, P14, P15
Multiple representations	P5, P8, P12	P1, P2, P4, P6, P9, P10, P13, P14	P3, P7, P11, P15
Community-industry engagement	P2, P8, P12, P15	P3	P1, P4, P5, P6, P7, P11, P13, P14

TABLE 3

Key elements from the inductive analysis of participants' D-STEM drawing and text.

	Drawing	Text	Drawing and text
Single disciplinary		P1	P6
Inter-/transdisciplinary			P2, P4, P8, P9, P12
Authentic learning environment	P4, P8, P9, P12		P2
Includes group work	P2, P13	P3, P4	P1, P5, P8, P10, P11, P12, P14
Interaction/working with community	P3, P12	P15	P8
Learning situated inside classroom	P1, P3, P4, P5, P6, P8, P10, P12, P13, P14		P11, P15
Learning situated outside classroom	P8, P9		P2, P4, P11, P15
Multifunction/flexible teaching space	P10		P1, P5, P12, P13, P14
Situates teacher at front of class	P13		P6, P14
Learning from existing knowledge	P6, P12, P13		P9, P15
Learning by doing (but not experimenting)	P4, P6, P14	P15	P1, P10, P12, P7
Developing new knowledge/understanding by inquiring/experimenting/creating	P5, P9	P6	P2, P8
Nondisciplinary (general pedagogy and/or learning environment)	P1		P3, P5, P7, P10, P11, P13, P14, P15

TABLE 4

Participants' responses against Vasquez's (2014) Inclined Plane of STEM Integration.

Type of STEM integration	Occurrence
Disciplinary	P1, P6
Interdisciplinary	P4
Transdisciplinary	P2, P8, P9, P12
Other	P3, P5, P7, P10, P11, P13, P14, P15

TABLE 5

Four key themes in responses to "STEM is…" prompt.

STEM is…	Participant
Science, technology, engineering, and mathematics	P2, P3, P5, P10, P14, P15
A way of understanding our world	P1, P3, P4, P12, P9
A way of thinking or logical thinking	P1, P4, P7
An inquiry-based or investigative approach	P5, P6, P14, P11, P12

TABLE 6

Participant responses to the prompt "STEM is…"

Participant	Statement
P1	Aimed to encourage, upgrade skills, give process in the areas of logical thinking and understanding the world in its abstract fundamental form
P7	A way of thinking about social, environmental, and economic problems; skill development for managing change in the future
P11	Teaching students to apply real scientific approach where science and math are instruments
P12	Learning how the world works and future research and development