D-STEM Rubric*

Coding category	**Definition**	**Level of inclusion**
STEM Integration	• students work on tasks in the context of complex phenomena or situations that require them to use knowledge and skills from multiple STEM disciplines	*Drawing or text includes:* **2:** reference to a context that might require students to use knowledge and skills from multiple STEM disciplines. **1:** reference to a context that might require students to use knowledge and skills from multiple STEM disciplines, but the nature of the problems or tasks is not explicit. **0:** no reference of such contexts or situations.
Realistic problems	• problems are realistic • problems are grounded in the real world • the context is not a problem of a particular STEM discipline but a problem for the community • students use STEM disciplines but the problem itself is interdisciplinary	*Drawing or text includes:* **2:** reference to interdisciplinary problems grounded in the real world. **1:** reference to problems that could involve realistic situations, but the nature of the problems is not explicit. **0:** no reference of realistic problems.
Collaborative nature of STEM	• students work collaboratively • teamwork does happen • members have roles and responsibilities	*Drawing or text includes:* **2:** reference to collaboration and teamwork among students in which members have roles and responsibilities. **1:** reference to collaboration/group work among students, but the type of collaboration is not explicit. **0:** no reference of collaboration.
Personal experience	• problems are meaningful, i.e. students can relate and engage with them • problems are realistic, i.e. students might make sense of them based on their own experiences • students might encounter the problems in their lives outside of school	*Drawing or text includes:* **2:** reference to a context that problems or tasks are linked to students' lives and tap into/elicit their interests. **1:** reference to a context that problems or tasks may be linked to students' lives and tap into/elicit their interests, but the nature of the problems is not explicit. **0:** no reference of personal relevance.
Multiple representations	• learning tasks or activities can lead to conceptual understanding of big ideas • concepts are presented in different modes of representations (e.g., spoken language, written symbols, diagrams, concrete models, metaphors) • learning tasks or activities are structured to require translations between these modes of representations	*Drawing or text includes:* **2:** reference to tasks or activities that could support multiple representations, and the translation between the representations are explicit. **1:** reference to tasks or activities that could support multiple representations, but translation between the representations are not explicit. **0:** no reference of multiple representations.

Coding category	Definition	Level of inclusion
Community–industry engagement[1]	• linking STEM disciplines with industry, the community and/or families • such links can involve one-off industry talks or through in-depth exploration of contextualised issues or problems *Engagements:* an engineer talks to students about their job during the immersion phase of a bridge-building unit. *Elaborations:* Rip Curl provides materials for a materials technology programme where students do tests with neoprene to design a wetsuit. *Contexts:* a unit on bees that explores the scientific, mathematical, economic, and social implications of bee parasitism. [1]*Note:* For more details see Hobbs et al. (2018)	*Drawing or text includes:* **2:** reference to linking content with industry, the community, or families in a variety of ways (engagement, elaborations, contexts). **1:** reference to linking content with industry, the community, or families, but the ways of linking are not explicit. **0:** no reference of community engagement.
The teaching and learning of STEM	*Teaching and learning practices* • experiential and open-ended methods such as science inquiry, engineering design, problem-based learning, and similar are implemented	*Drawing or text includes:* **1:** reference to such open-ended student-centred instruction. **0:** no reference of student-centred instruction.
	Tools • a range of learning technologies are used	*Drawing or text includes:* **1:** reference to using such teaching and learning technologies. **0:** no reference of using such learning technologies.
	Roles of the teacher • the teacher takes on roles other than knowledge giver (e.g., guide, collaborator)	*Drawing or text includes:* **1:** reference to the teacher roles other than giving knowledge. **0:** no reference of such teacher roles.
	Roles of the students • students take on roles other than listener or knowledge receiver (e.g., collaborator, planner, experimenter)	*Drawing or text includes:* **1:** reference to the student roles other than receiving knowledge. **0:** no reference of such student roles.

*Hatisaru, V. & Fraser, S. (2021). Make room for D-STEM. *Teaching Science, 67*(1), 11–20.