STEM Implementation Rubric

*\*prioritized, STEM-specific TPEs and CSTPs*

California State University Monterey Bay & Monterey Peninsula Unified School District





**About this Rubric**

California State University Monterey Bay (CSUMB) and the Monterey Peninsula Unified School District (MPUSD) partnered to develop an observational rubric for the purposes of bolstering STEM teaching practices in elementary and middle school classrooms. As it was necessary to cross-walk the CSTPs with the TPEs, this integrated tool captures both of these requirements with an intentional focus on STEM prioritized skills.

The tool and its accompanying training materials were developed using direct language from the 2016 version of the California Standards for the Teaching Profession and the 2017 California Teacher Performance Expectations, as well as with concepts and/or structures from additional tools such as the Center for Educational Leadership 5D+ Teacher Evaluation Rubric, the Charlotte Danielson Framework for Teaching, and the STEM Education Quality Framework.

Our goal is to provide Pre-Service Teachers with a non-evaluative tool that will assist them in identifying strong STEM teaching methods and honing their practices as STEM educators, with the added benefit of improving Cooperating Teachers’ skills as mentors and STEM teachers. Data and feedback on the tool will drive quality professional development with an emphasis on NGSS and CCSS-M to the Clinical Coaches, Pre-Service Teachers, and Cooperating Teachers as well as CSUMB and MPUSD personnel.

**Using this Rubric**

The STEM-Specific TPEs featured in the STEM Implementation Rubric represent the skills that have been prioritized by both partners in regards to effective STEM teaching. They are focused on field-specific, observable behaviors of teacher candidates and have been cross-walked with related CSTPs and previously utilized tools.

The rubric has possible ratings of 0-3:

* Ineffective = 0
* Emerging = 1
* Practicing = 2
* Applying = 3

An Ineffective rating (0) may require an intervention, such as an Action Plan. Emerging through Applying ratings (1-3) represent the range of behaviors likely to be observed in a Pre-Service teacher.   An Applying rating (3) realistically describes the upper limits of a Pre-Service Teacher.  The induction column is not scored in our program, as it extends into the teacher’s induction years.

During trainings for fidelity and calibration, we will explain how to determine where a teacher falls on the continuum using a preponderance of evidence in that category.  Teacher candidates will generally be scored in a column where the majority of evidence is witnessed.

We expect this instrument to be used by the Pre-Service Teacher, Clinical Coach, and Cooperating Teacher as a cumulative assessment tool, a debriefing tool for all STEM lesson observations, and a coaching tool for periodic classroom visits where STEM instruction is observed.

The STEM-specific teacher moves to be implemented in ALL STEM LESSONS are fully captured in the “Instructional Design and Implementation of STEM” and “Ensuring Equitable Access to STEM” Rubrics:

**Instructional Design and Implementation of STEM**

(Focal Standard = 3.1; Related Standards = 1.7, 3.3, 4.3)

(Focal Standard = 1.5; Related Standards 4.7, 5.3)

**Ensuring Equitable Access to STEM**

(Focal Standard = 4.4; Related Standards = 1.4; 1.6; 3.2, 3.5, 3.6, 4.8, 5.8)

The Eight Standards for Mathematical Practice and The Eight Practices of Science and Engineering are attached as an Appendix for reference:

 Appendix A: **Math, Science, and Engineering Practices**

The additional Rubrics which are utilized during CSUMB Pre-Service Teacher evaluations are also attached as Appendices for reference:

Appendix B**: Positive Environment** (Focal Standard = 2.2; Related Standards = 2.3, 2.5, 2.6)

Appendix C: **Knowledge of the Learner** (Focal Standard = 1.1; Related Standard = 1.3)

Appendix D: **Assessment and Monitoring of Student Learning** (Focal Standard = 5.1; Related Standard = 1.8)

**Instructional Design and Implementation of STEM (1 of 2)**

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| **3.1 Demonstrate knowledge of subject matter, including the adopted California State Standards\* and curriculum frameworks (Related standards 1.7, 3.3, 3.8, 4.3)****\***Common Core State Standards for ELA and **Math**, Common Core College and Career Readiness Standards, English Language Development Standards, **Next Generation Science Standards**, Health/PE Content Standards, Social Studies Content Standards, Visual and Performing Arts Standards, **International Standards for Technology Education**, World Language Content Standards) |
|  **Ineffective****(0)** | **Emerging****(1)** | **Practicing****(2)** | **Applying****(3)** | **Induction** |
| Objective(s), learning activities, and resources are not aligned with NGSS and CCSS-MContent includes frequent inaccuracies and builds misconceptions in STEM conceptsTeacher never connects STEM content to previous lessons and/or across content areas to deepen students’ understanding of STEM concepts (visual and performing arts and/or technology standards as applicable)  | Objective(s), learning activities, and resources are inconsistently aligned with NGSS and CCSS-MContent includes some inaccuracies and/or student misconceptions in STEM concepts are not recognized Teacher makes a connection to previous lessons and/or across content areas (visual and performing arts and/or technology standards as applicable) | Objective(s), learning activities, and resources are more consistently aligned with NGSS and CCSS-M Content appears to be accurate. The teacher supports understanding, but opportunities for misconceptions to drive instruction are minimal or missedTeacher makes multiple connections to previous lessons and /or across content areas (visual and performing arts and/or technology standards as applicable) | Objectives, learning activities, and resources are explicitly aligned with NGSS and CCSS-M All content appears to be accurate. An environment is created where misconceptions are utilized to drive instruction in STEM concepts Teacher creates opportunities for students to connect STEM content to previous lessons and across content areas (visual and performing arts and/or technology standards as applicable) | *To be completed by partner districts, based on respective expectations and/or observation tools*      |
| **Action Plan**  |
| **No objective for lesson set** |

**Instructional Design and Implementation of STEM (2 of 2)**

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| **1.5 Promote students' critical and creative thinking and analysis through activities that provide opportunities for inquiry, problem solving, responding to and framing meaningful questions, and reflection. (Related standards 4.7, 5.3)** |
|  **Ineffective****(0)** | **Emerging****(1)** | **Practicing****(2)** | **Applying****(3)** | **Induction** |
| Candidate does not include a range of activities that support development of critical thinking and STEM PracticesCandidate does not include a range of communication strategies between his/herself and the students or among the students. There is little discussionThe STEM lesson does not provide opportunities for the students to reflect, self-assess, and/or reframe their thinkingNo opportunity for students to reflect on high level questions (higher DOK)No opportunities for inquiry or utilization of the 5E model | Candidate incorporates a range of activities that begin to support development of critical thinking and STEM PracticesCandidate incorporates a range of communication strategies between his/herself and the students, but not among the students. The discussion is largely teacher-ledMinimal opportunities for the students to reflect, self-assess, and/or reframe their thinkingMinimal opportunities for students to reflect and discuss high level questions (higher DOK)Minimal evidence of opportunities for inquiry via the 5E model | Candidate incorporates a range of activities that foster development of critical thinking and STEM PracticesCandidate incorporates a range of communication strategies between his/herself and the students and among the students. However, the discussion only engages a subset of studentsOpportunities for the students to reflect, self-assess, and/or reframe their thinkingOpportunities for students to reflect and discuss high level questions (higher DOK)Evidence of opportunities for inquiry via the 5E Model  | Candidate incorporates a range of activities that encourage individual and collaborative critical thinking and STEM Practices Candidate incorporates a range of communication strategies between his/herself and the students and among the students. The discussion engages all studentsMultiple opportunities for the students to reflect, self-assess, and/or reframe their thinkingMultiple opportunities for students to reflect and discuss high level questions (higher DOK)Thoughtful design of inquiry-based experiences via the 5E Model | T*o be completed by partner districts, based on respective expectations and/or observation tools.*  |
| **Action Plan** |
| **Teacher relies solely on direct instruction** |

**Ensuring Equitable Access to STEM (1 of 1)**

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| **4.4 Plan, design, implement and monitor instruction, making effective use of instructional time to maximize learning opportunities and provide access to the curriculum for all students by removing barriers and providing access through instructional strategies** **(Related standards 1.4, 1.6, 3.2, 3.5. 3.6, 4.8, 5.8)** |
|  **Ineffective****(0)** | **Emerging****(1)** | **Practicing****(2)** | **Applying****(3)** | **Induction** |
| No variety of instructional strategies, materials, and technologies to support student access to the STEM lessonCandidate provides one modality by which students may practice and represent the STEM content, and the modality is effective for a few students No evidence of activities or resources recommended for instruction that advances English Learners' development in basic English structures (ELD), and academic English across subjectsNo evidence of explicit teaching of academic language, text structure, and/or language features to ensure equitable access of STEM subject matterNo evidence of scaffolds for emergent bilinguals and/or students with identified disabilities and/or scaffolds are not based on student data | A variety of instructional strategies, materials, and technologies observed, but limited impact on student access to the STEM lessonCandidate provides a limited set of modalities by which students may practice and represent the STEM content, and the modalities are effective for some students Candidate may use a research-based activity recommended for English Language Development and Specially Designed Academic Instruction in English (SDAIE) Evidence of attempted teaching of academic language, text structure, and/or language features to ensure equitable access of STEM subject matterEvidence of scaffolds for emergent bilinguals and/or students with identified disabilities in place, but these are not based on student data  | A variety of instructional strategies, materials, and technologies observed with evident impact on subset of students’ access to the STEM lesson (e.g. MTSS)Candidate provides students multiple modalities through which to practice and represent the STEM content, and these modalities benefit the majority of students (i.e. UDL)Candidate occasionally incorporates activities, resources and research-based methodologies that support students' first and second language development for Explicit ELD (elementary) or Integrated ELD (elementary & secondary, aka SDAIE) Some evidence of explicit teaching of academic language, text structure, and/or language features to ensure equitable access of STEM subject matterScaffolds in place, but emergent bilinguals and/or students with identified disabilities are not always able to access the curriculum. Scaffolds may be based on generalizations of student data | A variety of instructional strategies, materials, and technologies observed with evident impact on all students’ access to the STEM lesson (e.g. MTSS) Candidate provides students multiple modalities through which to practice and represent the STEM content and these modalities benefit all students (i.e. UDL)Candidate provides a supportive learning environment for students' first and second language development using research-based instructional approaches for ELD for elementary, Integrated ELD for secondary and Specially Designed Academic Instruction in English (SDAIE) across content areas. Evidence of explicit teaching of academic language, text structure, and/or language features to ensure equitable access of STEM subject matterScaffolds in place to ensure support for emergent bilinguals and/or students with identified disabilities and these are based on student data  |   *To be completed by partner districts, based on respective expectations and/or observation tools.*   |
| **Action Plan** |
| **Cannot identify students with documented needs****Does not provide accommodations based on student’s identified needs** |

**Appendix A: Math, Science, and Engineering Practices**

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| Eight Standards for Mathematical Practice | Eight Practices of Science and Engineering |
| * Make sense of problems and persevere in solving them.
* Reason abstractly and quantitatively.
* Construct viable arguments and critique the reasoning of others.
* Model with mathematics.
* Use appropriate tools strategically.
* Attend to precision.
* Look for and make use of structure.
* Look for and express regularity in repeated reasoning.
 | * Asking questions (for science) and defining problems (for engineering)
* Developing and using models
* Planning and carrying out investigations
* Analyzing and interpreting data
* Using mathematics and computational thinking
* Constructing explanations (for science) and designing solutions (for engineering)
* Engaging in argument from evidence
* Obtaining, evaluating and communicating information
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**Appendix B: Positive Environment (1 of 1)**

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| **2.2 Create learning environments (i.e., traditional, blended, and online) that promote productive student learning, encourage positive interactions among students, reflect diversity and multiple perspectives, and are culturally responsive. (Related standards 2.3, 2.5, 2.6)** |
| **Ineffective****(0)** | **Emerging****(1)** | **Practicing****(2)** | **Applying****(3)** | **Induction** |
| Behavior expectations (norms and procedures) are not setDoes not demonstrate high expectations for students Does not provide appropriate/individualized scaffolding for both behavior and academic needsNo support for independence and self-regulation among studentsNo support for collaboration among studentsNegative affect (frowning, sarcasm)Improper response to student bullying, racism, or sexismNot inclusive of diverse cultural, linguistic backgrounds, multiple points of view   | Behavior expectations (norms and procedures) are set, but not enforced or referenced Demonstrates high expectations for a subset of students Provides some scaffolding for either behavior or academic needsLimited evidence for support of student independence and self-regulationSupport for collaboration minimally evidentLimited evidence of caring and pleasant behaviorsIneffective response to student bullying, racism, or sexismSometimes inclusive of diverse cultural, linguistic backgrounds, multiple points of view  | Behavior expectations (norms and procedures) are set, and inconsistently enforced or referenced Demonstrates high expectations for multiple subsets of studentsProvides appropriate scaffolding for either behavior or academic needsEncourages independence and self-regulationEncourages collaborationCaring and pleasant Appropriate response to student bullying, racism, or sexism in response to school code of conductInviting diverse cultural, linguistic backgrounds, multiple points of view | Behavior expectations (norms and procedures) are set, and consistently enforced or referencedDemonstrates high expectations for all students Provides appropriate and individualized scaffolding for both behavior and academic needsClassroom environment supports student independence and self-regulationClassroom environment supports collaborationInteractions characterized by mutual respectNorms in place to prevent student bullying, racism, or sexismCulturally responsive pedagogy evidenced (Inclusive of diverse cultural, linguistic backgrounds, multiple points of view) |    *To be completed by partner districts, based on respective expectations and/or observation tools.* |
| **Action Plan** |
| **Classroom not safe****Not responsive to student bullying, racism, or sexism****Interactions not characterized by mutual respect** |

**Appendix C: Knowledge of the Learner (1 of 1)**

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| **1.1 Apply knowledge of students, including their prior experiences, interests, and social-emotional learning needs, as well as their funds of knowledge and cultural, language, and socioeconomic backgrounds, to engage them in learning. (Related standard 1.3)** |
|  **Ineffective****(0)** | **Emerging****(1)** | **Practicing****(2)** | **Applying****(3)** | **Induction** |
| Instruction and/or artifacts in room do not show evidence of consideration of students’ prior experiences, interests, social-emotional learning needs, and cultural and linguistic backgroundsNo focus on students, families, and richness of out-of-school experiences in the lessonKnowledge of the students is not applied to create a culture where students appear motivated, engaged, and active in their learning   | Instruction and/or artifacts in room rarely show evidence of consideration of students’ prior experiences, interests, social-emotional learning needs, and cultural and linguistic backgrounds Minimal focus on students, families, and richness of out-of-school experiences in the lessonKnowledge of the students is applied, but students appear minimally motivated, engaged, and active in their learning | Instruction and/or artifacts in room frequently show evidence of consideration of students’ prior experiences, interests, social-emotional learning needs and cultural and linguistic backgroundsLack of emphasis on what students and families know and/or no focus on richness of students out-of-school experiences in the lesson Knowledge of the students is applied, and students appear motivated, engaged, and active in their learning  | Instruction and/or artifacts in room consistently show evidence of consideration of students’ prior experiences, interests, social-emotional learning needs, and cultural and linguistic backgroundsEmphasis on what students and families know and richness of their out-of-school experiences in the lesson Knowledge of the students is applied to create a culture where students appear highly motivated, engaged, and active in their learning | *To be completed by partner districts, based on respective expectations and/or observation tools.* |
| **Action Plan** |
| **Does not acquire or apply knowledge of students****Respect for the diversity of students in the classroom is not demonstrated****Deficit language used** |

**Appendix D: Assessment and Monitoring of Student Learning (1 of 1)**

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| **5.1 Apply knowledge of the purposes, characteristics, and appropriate uses of different types of assessments (e.g., diagnostic, informal, formal, progress-monitoring, formative, summative, and performance) to design and administer classroom assessments, including use of scoring rubrics. (Related standard 1.8)** |
|  **Ineffective****(0)** | **Emerging****(1)** | **Practicing****(2)** | **Applying****(3)** | **Induction** |
| Use of each type of assessment as related to the instruction/activity is unclearDoes not implement formative assessments to monitor progress of students toward achieving the academic standards addressed in the lessonLimited evidence of strategies for monitoring student learning during instructionFocus of monitoring is on behavior rather than learning   | Use of each type of assessment as related to the instruction/activity is somewhat apparentInconsistently implements formative assessments to monitor progress of students toward achieving the academic standards addressed in the lessonTreats class as “one plan fits all” with minimal modificationsBeginning to focus on monitoring of learning rather than just behavior | Appropriate use of each type of assessment as related to the instruction/ activity is apparentImplements formative assessments randomly to monitor progress of students toward achieving the academic standards addressed in the lessonUses assessment results to re-teach and/or adjust the pace of instruction for the class but not for specific individuals or groups of studentsFocus is primarily on monitoring learning rather than behavior | Appropriate use of each type of assessment as related to the instruction/ activity is carefully consideredImplements formative assessments at strategic points in the lesson to monitor progress of students toward achieving the academic standards addressed in the lessonUses assessment results to re-teach and/or adjust the pace of instruction for both the class and specific individuals or groups of studentsFocus is on monitoring student learning, using both informal and formal strategies  | *To be completed by partner districts, based on respective expectations and/or observation tools.*      |
| **Action Plan** |
| **Formal or informal strategies for monitoring student learning are missing****Assessment is not occurring in the lesson because of a focus on behavior** |