RIGOR

TEACHING DIMENSIONS	APPLYING LEVEL 4	DEVELOPING LEVEL 3	EMERGING LEVEL 2	INTENDING LEVEL 1
ENGAGING STUDENTS IN RIGOROUS MATHEMATICAL TASKS	Students engage in cognitively high level tasks including Common Core math practices such as proving, making and testing conjectures, modeling with mathematics, and/or connecting with multiple representations	Students engage in cognitively high level tasks that support procedural knowledge with connection to conceptual understanding or mathematical reasoning. Students engage in some complex thinking. Mathematical tasks support students to understand mathematical concept(s).	Students engage in cognitively low level tasks, primarily procedural and memorization tasks such as practice using algorithms and formulas, copying notes, and recalling memorized facts that require little/no critical thinking or connection to mathematical concepts	Students engage in inaccurate mathematics or non-mathematics. Students engage in inappropriate tasks that are not aligned with the learning goals of the lesson.
Examples	**Doing Mathematics** -Concept maps -High Level Tasks: Problem of the Week -Pressing for accuracy, error analysis, testing conjectures, consensus, justifications and explanations, generalizations, pressing for reasoning, analysis, evaluating strategies, connecting ideas across methods/ representations, point to key information, argumentation, math modeling		**Formative Assessment** -Group assessment: human barometer, board talk, whip around, community circles, think-pair-share -Individual assessment: exit slips, traffic light, thumbs down, 3-2-1, agree/disagree, boards up, receptive modalities: sorting, gestures, showing. boards up, and board talk -Multiple opportunities for students to demonstrate learning such as practicing problems and poster presentations	
RELATING COURSE CONCEPTS TO COMPUTATIONAL THINKING (CT) CT PRACTICES	Teacher provides students first-hand opportunities to identify and apply one or more CT practices to support a deeper understanding of the course concepts. Level Note: -Doesn't have to be explicit CT with the academic label -Identification of CT moment might happen later in the lesson not at the moment it actually happened. -The Math or Science practice is framed in terms of CT rather than the content practice.	Teacher provides students opportunities to incorporate CT practices as a means to support the development of the instructional goals or concept(s).	Teacher identifies or uses one or more CT practices but make no or superficial connection of the course concepts.	Teacher provides no opportunities to relate CT practices to the concepts within the lesson.
Examples	**Abstraction** **Teacher** -Guide students to represent solutions to problems in a higher form of abstraction or explore how the abstracted form can be applied to multiple scenarios or contexts -Presents models, simulations, symbolic notation, proofs, as abstractions that seek to represent or communicate key ideas that are considered relevant to the problem or work at hand **Student** -Extract common features from a set of interrelated processes or complex phenomena/big-ideas. ex: identify patterns across systems or problems and generalize a rule or tendency -Explore limitations of models and the ways in which they represent real-world phenomena/themes/big-idea -Use of software or programming to create data visualizations as a means to express relationships between variables of interest **Algorithmic Thinking** **Teacher** -Have students compare procedures to evaluate the strengths and limitations of each **Student** -Compare sequence of steps and use the process of debugging to identify where the process broke down or error was introduced -Develop actionable/repeatable steps/approaches -Iterate over designs/tests/solutions in a systematic way -Use computing to automate processes or solutions through the implementation of a series of ordered steps. ex. program continual data collection via technology		**Communicating With and About Computing and Data** **Teacher** -Explore how problems posed to a human vs a computer require different approaches **Debugging and Evaluating** **Teacher** -Models (via a think aloud or solution) how methodological approaches can be used to debug a problem **Student** -Debug designs/tests/models/solutions or computational artifacts and consider issues of efficiency, effectiveness, inclusiveness, or ethics - Identify, analyze, and implement possible solutions with the goal of achieving the most efficient and effective combination of steps and resources. **Decomposition** **Teacher** -Identify when it's appropriate to solve a problem computationally **Student** - Decompose the problem into smaller tasks/steps	

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TEACHING DIMENSIONS	APPLYING LEVEL 4	DEVELOPING LEVEL 3	EMERGING LEVEL 2	INTENDING LEVEL 1
RELATING COURSE CONCEPTS TO DATA	Teacher provides students first-hand opportunities for using data to investigate relevant questions that connect to the instructional goals or concept(s).	Teacher provides students opportunities to engage with data as a means to support the development of the instructional goals or concept(s).	Teacher explicitly incorporates data but it is disconnected from the instructional goals or concept(s)	Teacher provides no opportunities for students to relate data to the instructional goals or concept(s)
Examples	**Teacher:** -Encourages students to evaluate affordances or consequences of different plots and how data might impact individuals or populations -Guides students to recognize details that are lost or emphasized in representations, or explorations of bias -Guides students to recognize the conditions that make predictions/ inferences possible -Incorporates statistical thinking and or measures to help students describe variability and/or probability -Provides primary or secondary data of interest to the students for the instructional goal -Situate data analysis and interpretation as a necessary step for argumentation and/or evaluation of claims -Uses "messier data" which require group/class negotiation or recategorization		**Student:** -Construct statistical questions of interest that are relevant to the task -Create/run simulations of models and or exploring mismatches between expected outcomes and experimental outcomes -Create visualizations that communicate patterns in the data and support data-based claims (data representation and summarizing) -Generate new variables from existing data sets e.g. mutating/transforming, recategorization, or developing numerical values for representing categorical data -Identify and use data collection techniques around a question of interest -Interrogate primary and secondary data sets e.g. consider complexity, bias, and errors from collection methods as well as data interpretations generated from data -Recognize when data are needed to answer questions of interest or to evaluate claims presented (asking statistical questions)	

DISCOURSE

DISCOURSE AROUND COMPUTATIONAL THINKING AND DATA	Teacher and student discourse explicitly identifies one or more CT/Data practices related to the instructional goals or concept(s). Level note: This level requires Students to demonstrate awareness of their engagement in CT/Data practices or concepts. (Discourse may be visible orally, or in boards, online spaces, or others)	Teacher discourse explicitly identifies one or more CT/Data practices related to the instructional goals or concept(s). Level note: This level includes only teacher discourse (i.e., student talk does not explicitly identify specific labels for CT/Data practices).	Teacher or student discourse may incorporate one or more practices or concepts related to computational thinking, but does not explicitly identify specific labels for CT/Data practices.	Teacher and student do not make any mention or use of either CT or Data practices within the lesson.
Examples	**Abstraction** **Student:** -Use data storytelling/cycle as a means to communicate the meaning behind the data but also implications of it. **Debugging and Evaluation** **Student:** -Discussions that consider efficiency vs. accuracy among different problem-solving approaches or experimental procedures. **Decomposition and Algorithmic Thinking** **Student** -Use CT to decompose the problem into smaller tasks and/or develop actionable/repeatable steps/approaches (algorithmic thinking).		**Communication About CT and Data** **Student** -Data talks: small and whole group sensemaking activities about data sets, representation and or identifying salient patterns. **Teacher** -Explicitly mark how CT/Data practices are being used in the task and how it aligns/differs to the disciplines' practices. -Models (think alouds or discussions) critical data interrogation practices; where did the data come from, who decided what counts as data, who or what was included or excluded in this process. -Positions computing/data artifacts as tools professionals use to communicate explanations or justifications for a given idea; surfaces limitations or impacts of artifacts. -Recognize and illustrate that whether communicating with a computer or people, clear inputs and outputs are required elements of dialogue. -Structure reflective communication tasks to help students connect the lesson to CT or data practices.	

EQUITABLE ACCESS TO CONTENT RELEVANT FOR LEARNERS

TEACHING DIMENSIONS	APPLYING LEVEL 4	DEVELOPING LEVEL 3	EMERGING LEVEL 2	INTENDING LEVEL 1
EXPLORING SOCIAL JUSTICE ISSUES	Teacher invites students to examine content focused on their community, counternarratives, or broader socio-political issues/systems that produce inequitable opportunities for individuals and groups (that may prompt action).	Teacher makes connections or draws implications to examine content focused on their community, shares counternarratives or connects to broader socio-political issues/systems that may produce inequitable opportunities for individuals and groups.	Teacher makes superficial connections to real world/community issues, not tied to broader socio-political issues.	Limited to no evidence of connecting contents to real world/community questions.
Examples	**Student actions** - Surfaces the diverse perspectives and experiences of the students within the classroom as students engage with CT/Data/Science or Math Practices - Students explore connections to socio-political issues related to STEM such as but not limited to environmental justice, health justice, food access, differing arrest rates, affordability and SES questions and their underlying issues - YPAR, Problem, Project based learning that critically engagement, families and communities - Students engage with data, results to critically reflect. - Students take action around about socio-political issues related to STEM		**Teacher actions** - Elicits and facilitates conversations about minoritized groups in STEM - Has a guest speaker of color in STEM - Engages in mentoring across schools, or with college students that offer a vision of access and constructive dialogue - Engages the community and families in STEM actions	
MAKING COMPUTATIONAL THINKING AND DATA RELEVANT FOR LEARNERS	Teacher provides students opportunities to make connections to their personal experiences using CT/Data to address issues that affect them or their communities	Teacher provides students opportunities to explore how CT/Data can help describe or understand broad real-world issues and problems.	Teacher explains how CT/Data can help describe or understand real-world issues and problems.	Teacher does not connect CT/Data tasks to real-world issues.
Examples	**Student actions** -Surfaces the diverse perspectives and experiences of the students within the classroom as students engage with CT/Data -Identify datasets/simulations/visualizations that are relevant to the topic of interest or community -Incorporate CT/Data into communication products to peers or community members -Craft a survey to understand class/school/local community interests or concerns		**Teacher actions** -Lesson centers CT or data to explore or understand a topic of interest -Position CT/Data to reveal a phenomenon or concept -CT/Data used to inspire students to take action within the community -CT/Data surfaces justice/injustice issues within the community -CT/Data exploration leads to conversations about ethics or community impacts -Elicits diverse perspectives from the classroom or larger community around CT or data artifacts	

CLASSROOM ECOLOGY

TEACHING DIMENSIONS	APPLYING LEVEL 4	DEVELOPING LEVEL 3	EMERGING LEVEL 2	INTENDING LEVEL 1
COLLABORATING AROUND COMPUTATIONAL THINKING AND DATA	Teacher provides students opportunities for input or choice within the collaboration approaches in direct support of the learning goals within the Data or CT tasks.	Teacher directs students to use one or more collaboration approaches in direct support of the learning goals within the Data or CT tasks.	Teacher uses a collaboration approach within the Data or CT tasks, but it is limited to a routine, or not central to the learning goals.	Teacher does not provide an approach for collaboration around explicit Data or CT tasks.
Examples	**Student actions** -Decide how small and whole groups will review, refine, debug, and or provide feedback around classroom products. Ex peer-review -Expert groups or delegations of data tasks around a larger central data set to collaboratively answer research questions of interest -Participate and contribute to collaborative computing by sharing, remixing or using code from public/private repositories (i.e. gitHub) -Persistence in working through difficult problems either, working with others and or self -Use choices/options available to meet learning goals and or change approach when current methods are not working		**Teacher actions** -Offers various strategies for structured speaking, listening, or consensus building around CT/Data -Positions computational artifacts as tools to help creators solve both practical and societal problems and are also a form of personal expression and thus open to bias -Positions Use-Modify-Create approach to solving problems, working together, or learning new skills -Provides multiple tools or approaches for students to create data and computing artifacts	