Silicon Valley Mathematics Initiative

The Mathematics Teaching Rubric

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Mathematics Teaching Rubric

Worthwhile Tasks

4 – Exemplary Teaching	3– Successful Teaching	2– Improving Teaching	1– Limited Teaching
The teacher engages the students in worthwhile tasks. The tasks are all part of a coherent curriculum that develops student understanding and facility with mathematics. The mathematics of the tasks is clear and aligned with core standards and developed to make sense of the world. The tasks engage students' thinking, conceptual development, and problem solving as well as skills. The tasks involve a wide range of mediums (graphs, charts, problems, symbols, equations, manipulatives, technology, etc.). The teacher selects materials and tasks that build on and extend from the students' understanding. Most of the tasks foster students' ability to solve problems, reason and communicate. The tasks range across most learning styles and modalities. The task may grow out of a student's conjecture or questions. Often the tasks may be approached in more than one interesting and legitimate way. Most of the tasks vary in length of time required to develop solutions.	Often the teacher engages the students in worthwhile tasks. Most of the tasks are part of a coherent curriculum that develops students' understanding and facility with mathematics. The mathematics of the tasks is often clear and aligned with core standards and developed to make sense of the world. Many of the tasks engage student thinking, conceptual development, and problem solving as well as skills. The tasks involve a range of mediums. The teacher often selects materials and tasks that build on and extend from the students' understanding. Many of the tasks foster students' ability to solve problems, reason and communicate. The tasks range across many learning styles and modalities. The tasks may grow out of a student's conjecture or questions. Many of the tasks may be approached in more than one interesting and legitimate way. Many of the tasks vary in length of time required to develop solutions.	Fairly often the teacher engages the students in worthwhile tasks. The tasks are usually a balance between lessons from adopted textbooks and investigations or non-routine problems. The mathematics of the tasks is usually clear and aligned with core standards and developed to make sense of the world. Some of the tasks engage students' thinking, conceptual development, and problem solving as well as skills. Some tasks involve a range of mediums. The teacher sometimes selects materials and tasks that build on and extend from the students' understanding. Some of the tasks foster students' ability to solve problems, reason and communicate. Some of the tasks range across learning styles and modalities. A few of the tasks may grow out of a student's conjecture or questions. Some of the tasks may be approached in more than one interesting and legitimate way. Some of the tasks require more time to develop solutions.	Occasionally the teacher engages the students in worthwhile tasks. The tasks are usually a part of an adopted textbook curriculum. The mathematics of the tasks focuses on skill acquisition and developing procedural knowledge. A few of the tasks engage student thinking, conceptual development, and problem solving as well as skills. A few tasks involve a range of mediums. Occasionally the teacher selects materials and tasks that build on and extend from the students' understanding. A few of the tasks foster students' ability to solve problems, reason and communicate. Most of the tasks involve direct instruction and modalities. A few of the tasks may be approached in more than one interesting and legitimate way. A few of the tasks require more time to develop solutions.

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The Learning Environment

4 – Exemplary Teaching	3– Successful Teaching	2– Improving Teaching	1– Limited Teaching
The teacher creates a classroom environment where students actively construct their own understanding of mathematics and learn to use mathematics to make sense of the world. The teacher creates a culture that fosters the development of each student's mathematical power and supports the class as a community of learners. The teacher provides and structures the time necessary to explore sound mathematics and grapple with significant ideas and problems. The physical space and materials are purposely arranged and allocated in ways that facilitate students' learning. The teacher provides context that encourages the development of mathematical skill and proficiency. Respect and value of students' ideas, ways of thinking and positive disposition to mathematics are essential attributes of the learning community. The teacher consistently expects and encourages students to work independently or collaboratively to make sense of mathematics. Students take intellectual risks by raising questions, sharing results and formulating conjectures. The students display a sense of mathematical competence by validating and supporting ideas with mathematical arguments.	Often the teacher allows students to actively construct their own understanding of mathematics and learn to use mathematics to make sense of the world. The culture often fosters the development of each student's mathematical power and supports the class as a community of learners. The teacher provides and structures significant time to explore sound mathematics and grapple with significant ideas and problems. The physical space and materials are arranged and allocated in ways that can facilitate students' learning. The teacher provides context that often encourages the development of mathematical skill and proficiency. Respect and value of students' ideas, ways of thinking and positive disposition to mathematics are often part of the learning community. The teacher often expects and encourages students to work independently or collaboratively to make sense of mathematics. Students occasionally take intellectual risks by raising questions, sharing results and formulating conjectures. The students may display a sense of mathematical competence by validating and supporting ideas with mathematical arguments.	The teacher regularly encourages students to learn to use mathematics to make sense of the world. The culture fosters the development of student's mathematical skills and some problem solving. Occasionally the teacher supports the class to function as a community of learners. The teacher provides and structures some time to explore non-routine problems and grapple with conceptual ideas. The physical space and materials are arranged and allocated in ways that attempt to facilitate students' learning. The teacher strives to develop the student's numerical skill and proficiency. Students' ideas and ways of thinking are sometimes part of the learning activity. The teacher often expects students to work independently and may use some collaborative groups. Often the teacher involves students by having them raise questions and share results.	Some assigned problems require students to learn to use mathematics to make sense of the world. The class is usually taught in a direct instruction format. Usually the focus of the lesson is on skill attainment or learning mathematical procedures and definitions. Sometimes the teacher assigns non-routine or word problems. The physical space and materials are arranged and allocated in ways that structure students' work. The teacher's goal is to develop the students' numerical skills and proficiency. Students are required to practice during class and complete homework. The teacher often expects students to work independently and may use some collaborative groups. Often the teacher asks the students to show work on individual problems. Occasionally students are asked to share answers with the class. Students are encouraged to ask questions if they lack understanding.

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Teacher's Role in Discourse

4 – Exemplary Teaching	3– Successful Teaching	2– Improving Teaching	1– Limited Teaching
The teacher orchestrates discourse in the class. The teacher poses questions and tasks that elicit, engage, and challenge each student's thinking. The teacher listens carefully to the students' ideas and discerns mathematical meaning and relevancy from student responses. Students are asked to clarify and justify their ideas orally and in writing. The teacher decides what to pursue in depth from among the ideas that students bring up during a discussion. Care is given by the teacher to develop concepts thoroughly and insure students' ownership and understanding. The teacher decides when and how to attach mathematical notation and language to students' ideas. The teacher has full understanding of the mathematical goals of the lesson and decides when to provide information, when to clarify an issue, when to model, when to lead, and when to let a student struggle with difficulty. These decisions are consistent with the goal and pace of the lesson. The teacher monitors students' participation in discussions and decides when and how to encourage each student to participate. These decisions are predicated on insuring all students will learn and be successful in mathematics.	The teacher often orchestrates discourse in the class. The teacher often poses questions and tasks that elicit, engage, and challenge each student's thinking. Often the teacher listens to the students' ideas and makes sense of their responses. Often students are asked to clarify and justify their ideas orally and in writing. The teacher may decide what to pursue in depth from ideas that students bring up during a discussion. Some care is given by the teacher to develop concepts and to encourage students' ownership and understanding. The teacher attempts to attach mathematical notation and language to students' ideas. The teacher has good understanding of the mathematical goals of the lesson and is often successful in determining when to provide information, when to clarify an issue, when to model, when to lead, and when to let a student struggle with difficulty. These decisions are often consistent with the goal and pace of the lesson. The teacher attempts to monitor students' participation in discussions and decides when and how to encourage students to participate. Attempts are made to reach all students.	The teacher directs the class and attempts to foster discourse. Sometimes the teacher poses questions and tasks that elicit, engage, and challenge students' thinking. The teacher listens to some of the students' ideas. The teacher may have difficulty following students' math thinking. Sometimes students are asked to clarify and justify their ideas orally and in writing. The teacher rarely deviates from the lesson plan to pursue ideas that students bring up during a discussion. Some care is given by the teacher to develop concepts and to encourage students' ownership. The teacher follows the textbook in deciding when and how to introduce mathematical notation and language. The teacher follows the curricula math goals of the lesson. The teacher is improving their questioning strategies. The teacher is developing the pacing and generating good questioning. The instructional decisions may be aligned with lesson goals. The teacher attempts to include all students.	The teacher directs the class. The teacher poses questions and tasks that focus students' work. The teacher may listen to some of the students' responses. The teacher may have difficulty following students' math thinking and usually ignores those responses. Rarely are students asked to clarify and justify their ideas orally and in writing. The teacher rarely deviates from the textbook to pursue ideas that students bring up during a discussion. The teacher usually follows the textbook in deciding when and how to attach mathematical notation and language to students' ideas. The teacher follows the curricula math goals of the lesson. The instructional decisions may be aligned with state standards and with the goal of covering the topics on the state test. The teacher modifies expectations from student to student.

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Students' Role in Discourse

4 – Exemplary Teaching	3– Successful Teaching	2– Improving Teaching	1– Limited Teaching
The teacher of mathematics promotes classroom discourse in which students take ownership and responsibility. Students listen to, respond to and question the teacher and one another. The students use a variety of tools to reason, make connections, solve problems and communicate. Students often initiate problems and questions for the class to ponder and study. Students regularly make conjectures and present solutions. Students explore examples and counterexamples to investigate conjectures. Students try to convince themselves and one another of the validity of particular representations, solutions, conjectures and answers. Students rely on mathematical evidence and argument to determine validity. In small or large groups, students are an audience for one another's comments, explanations or questions. The discourse is focused on making sense of mathematical ideas and/or on using mathematical ideas sensibly in setting up and solving problems.	The teacher of mathematics often promotes classroom discourse in which students take ownership and responsibility. Students often listen to, respond to and question the teacher and one another. The students use some tools to reason, make connections, solve problems and communicate. Students sometimes initiate problems and questions for the class to ponder and study. Students often make conjectures and present solutions. Students may explore examples and counterexamples to investigate conjectures. Students occasionally try to convince themselves and one another of the validity of particular representations, solutions, conjectures and answers. Sometimes students rely on mathematical evidence and argument to determine validity. In small or large groups, students are often an audience for one another's comments, explanations or questions. The discourse often is focused on making sense of mathematical ideas and/or on using mathematical ideas sensibly in setting up and solving problems.	The teacher of mathematics tries to promote classroom discourse in which students take some ownership and responsibility. Occasionally students listen to, respond to and question the teacher and one another. The students use a few tools to reason, make connections, solve problems and communicate. Once in a while students initiate problems and questions for the class to ponder and study. Students occasionally make conjectures and present solutions. Students occasionally explore examples and counterexamples to investigate conjectures. In a few situations students rely on mathematical evidence and argument to determine validity. In small or large groups, students are occasionally an audience for one another's comments, explanations or questions. The discourse sometimes focuses on making sense of mathematical ideas and/or on using mathematical ideas sensibly in setting up and solving problems.	The teacher of mathematics structures the discourse of the students. Often students are asked questions by the teacher and are expected to respond with answers. The students use a few tools to solve problems and do math tasks. For specific assignments students create problems and questions for the class to do. Students are asked to present answers or solutions. Students learn and practice math procedures, vocabulary and facts. Occasionally students work in small groups on problems, discussing answers. In large groups, students go over problems and solutions usually facilitated by the teacher. The discourse involves learning procedures and methods to solve problems and activities to memorize facts and vocabulary.

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Tools for Enhancing Discourse

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The teacher supports discourse and a positive classroom culture by encouraging and supporting students to use tools to do and learn mathematics. The teacher supports the doing of mathematics in the manner that mathematics is done outside of school. The teacher values and encourages the use of a variety of tools such as computers, calculators and other technology in addition to traditional paper and pencil and mental math. Students communicate orally and in writing using pictures, diagrams, tables, graphs, notation, symbols, narratives, metaphors, justifications and proofs. Students use models and concrete materials to make sense of mathematics and understand concepts. Students are responsible for selecting and using appropriate tools to solve and investigate problems. The teacher introduces conventional notation at points when doing so can further the work and the discourse at hand. Students are expected to communicate their conjectures, explanations and arguments in a complete manner using appropriate tools.	The teacher usually supports discourse by encouraging and supporting students to use tools to do and learn mathematics. Often the teacher values and encourages the use of a variety of tools such as computers, calculators and other technology in addition to traditional paper and pencil and mental math. Often the teacher has the students communicate orally and in writing using pictures, diagrams, tables, graphs, notation, symbols, narratives, metaphors, justifications and proofs. Often the teacher has students use models and concrete materials to make sense of mathematics and understand concepts. Occasionally students are responsible for selecting and using appropriate tools to solve and investigate problems. The teacher attempts to introduce conventional notation at points when doing so can further the work and the discourse at hand. Occasionally students are expected to communicate their conjectures, explanations and arguments in a complete manner using appropriate tools.	The teacher structures the tools that will adapt to the particular mathematics lessons. The teacher finds times to use computers and other technology. The teacher attempts to balance the time when students use calculators, paper and pencil, and mental math. The teacher will, at certain times, encourage the students to communicate using pictures, diagrams, tables, graphs, notation, symbols, narratives, metaphors, justifications and proofs. Students use manipulatives on appropriate activities. The teacher introduces conventional notation often after students have had some kind of concrete experience or when the textbook suggests the teacher do so. Occasionally students communicate their solutions and explanations using a variety of tools.	The teacher directs the class as to when they may use a certain math tool. The teacher may do an activity with the computer or use it for those who either need practice or have finished their assignments. The teacher will allow students to use a calculator after they have shown they can calculate accurately using paper and pencil. The teacher directs the type of outputs expected such as charts, graphs, equations or proofs. When called for in a lesson, the class may use manipulatives. The teacher regularly introduces the conventional notation to the class. There may be special projects or assignments where students communicate using alternative materials or tools.

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Teaching and Learning Analysis

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The teacher understands that assessment of students, analysis of instruction and the learning experience are fundamentally interconnected. The teacher engages in ongoing analysis of teaching and learning by observing, listening to, and gathering information about the students to assess what they know and are able to do. The teacher examines the effects of the tasks, discourse and learning environment on students' mathematical knowledge, skills and dispositions. The teacher assesses what every student is learning, the concepts they understand and whether they are doing significant mathematics. The teacher changes and adapts instruction based on the ongoing assessment of the students. The teacher regularly revises short- and long-range plans. The teacher challenges and extends students' ideas. The teacher attends to the broad array of dimensions that contribute to students' mathematical competence. The teacher regularly describes and comments on each student's learning to the parent, other involved educators and the students themselves. The teacher uses a large variety of assessment measures and mediums to develop a robust evaluation of students.	Often the teacher links assessment with the curriculum. The teacher routinely engages in analysis of teaching and learning by observing, listening to, and gathering information about the students to assess what they know and are able to do. The teacher often examines the effects of the tasks, discourse and learning environment on students' mathematical knowledge, skills and dispositions. The teacher routinely assesses what many of the students are learning and the concepts they understand. Usually the teacher changes and adapts instruction based on the ongoing students' understandings. The teacher may revise short- and long-range plans. The teacher often challenges and extends students' ideas. The teacher attends to an array of dimensions that contribute to students' mathematical competence. The teacher routinely describes and comments on each student's learning to the parent, other involved educators and the students themselves. The teacher uses a variety of assessment measures and mediums to develop a fair evaluation of students.	The teacher attempts to link assessment with the curriculum. The teacher assesses mostly by examining written products but also by observing, listening to, and gathering information about the students. Periodically the teacher will reflect on the lessons and learning experiences and compare their effectiveness with student progress. The teacher paces the class based on what most of the students are accomplishing. The teacher will attempt to differentiate instruction and activities for the most successful and most challenged students. The teacher may revisit lessons where students have been unsuccessful. The teacher attempts to use multiple representations to address learning styles. The teacher follows conference and report card procedures to keep parents informed of students' progress. The teacher uses different evaluation measures such as tests, quizzes, homework, classwork, reports, participation, etc. as the basis for the students' grades.	The teacher assesses the students on mathematical ideas and problems after the students have been taught. The teacher bases his/her evaluation mostly on the examination of written products which are usually tests and quizzes. The teacher may also grade students on homework and class participation. Classroom behavior is often a factor in the students' grades. The teacher is diligent about following the timeline of instruction based on a set of standards, a continuum and/or the textbook. The teacher may provide extra credit to those students who are the most successful and remedial assignments to the most challenged students. Depending on time available the teacher may re-teach lessons where students have been unsuccessful. The teacher uses mostly direct instruction for efficiency. The teacher follows the district reporting policy for report cards. The teacher may use different evaluation measures but tests have the most weight.

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