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MATHematics

Culturally Responsive Mathematics Teaching – TM
Lesson Analysis Tool

PURPOSE:

CRMT-TM Lesson Analysis Tool is designed to promote intentional teaching discussions and critical reflection on mathematics lessons with a combined focus on children's mathematical thinking and equity. It is not designed to be an evaluation tool of teachers but a self-reflective professional tool that can support lesson/unit design and implementation.

TOOL DESCRIPTION:

The **CRMT-TM Lesson Analysis Tool** consists of six important categories of mathematics teaching. Each category connects to a rubric rating scale 1-5 that provides descriptors of classroom practice including task design, implementation, and interaction. In addition, there are corresponding reflection prompts to help with lesson analysis. The table below provides a brief description of each category and accompanying reflection prompt.

	Category	Reflection Prompts
1	**Cognitive Demand**	***How does my lesson enable students to closely explore and analyze math concepts(s), procedure(s), and reasoning strategies?***
2	**Depth of Knowledge & Student Understanding**	***How does my lesson make student thinking/understanding visible and deep?***
3	**Mathematical Discourse**	***How does my lesson create opportunities to discuss mathematics in meaningful and rigorous ways (e.g. debate math ideas/solution strategies, use math terminology, develop explanations, communicate reasoning, and/or make generalizations)?***
4	**Power and Participation**	***How does my lesson distribute math knowledge authority, value student math contributions, and address status differences among students?***
5	**Academic Language Support for ELL**	***How does my lesson provide academic language support for English Language Learners?***
6	**Cultural/Community-based funds of knowledge**	***How does my lesson help students connect mathematics with relevant/authentic situations in their lives?*** ***How does my lesson support students' use of mathematics to understand, critique, and change an important equity or social justice issue in their lives?***

HOW TO USE:

The best use of this tool is to promote critical discussion and reflection on math lessons with an integrated focus. It is not necessary for every single lesson to have every single category. However, the CRMT-TM lesson analysis tool does make explicit the categories of practice that should be consistently evident over time. In addition, our work with the tool suggests that categories 4-6 are less likely to be selected for lesson analysis than categories 1-3. Therefore we recommend that users of this tool be intentional in making sure that categories focusing on power and participation, academic language, and cultural funds of knowledge be examined.

To help teachers get started we suggest three strategies:

1) **Analyze a videotaped lesson using the tool**. Some good videos are publically available at www.learner.org. In pairs, rate the lesson based on evidence from the video. Discuss ratings and evidence with a colleague.
2) **Analyze a lesson plan using the tool**. Check how your lesson plan reflects these various dimensions. After your analysis, brainstorm with a colleague/coach what adaptions you can make to make the lesson more culturally responsive.
3) **Have a peer use the tool to give feedback on an observed lesson**. Select one category from categories 1-3 and one from categories 4-6. Make a conscious effort to focus your instruction and feedback based on those selected categories.

RELATED REFERENCES:

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Aguirre, J. & Zavala, M. (2013). Making culturally responsive mathematics teaching explicit: A lesson analysis tool. Pedagogies: An International Journal,DOI:10.1080/1554480X.2013.768518

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Turner, E. E., Drake, C., Roth McDuffie, A., Aguirre, J. M., Bartell, T. G., & Foote, M. Q. (2012). Promoting equity in mathematics teacher preparation: A framework for advancing teacher learning of children's multiple mathematics knowledge bases. *Journal of Mathematics Teacher Education, 15*(1), 67-82. doi: 10.1007/s10857-011-9196-6.

Rating / Category		1	2	3	4	5
1) Cognitive Demand	***Guiding Question: How does my lesson enable students to closely explore and analyze math concepts(s), procedure(s), and reasoning strategies?***					
	Description of rating	Students receive, recite, or memorize facts, procedures, and definitions. There is no evidence of conceptual understanding being required. No opportunities for mathematical analysis or exploration	Students primarily receive, recite, or perform routine procedures without analysis or connection to underlying concepts or mathematical structure. Some opportunities for mathematical exploration, but tasks do not require analysis to complete.	There is at least one sustained activity involving analysis of procedures, concepts, or underlying mathematical structure. There is at least 1 sustained activity that requires mathematical exploration and analysis	At least half of the lesson includes task(s) that: • Require close analysis of procedures, concepts or underlying mathematical structure. OR • Tasks that require significant mathematical analysis, involves complex mathematical thinking, utilizes multiple representations OR demands explanation/justification There is evidence of sustained mathematical analysis for at least half of the lesson.	The majority of the lesson includes task(s) that require close analysis of procedures and concepts, involves complex mathematical thinking, utilizes multiple representations AND demands explanation/justification A large majority of the lesson sustains mathematical analysis.
2) Depth of Knowledge and Student Understanding	***Guiding Question: How does my lesson make student thinking/understanding visible and deep?***					
	Description of rating	Knowledge is very thin because concepts are treated trivially or presented as non-problematic. Students are not involved in the coverage of information they are to remember.	Knowledge remains superficial and fragmented. Underlying or related concepts and ideas might be mentioned or covered, but only a superficial acquaintance or trivialized understanding of these ideas is evident.	Knowledge is treated unevenly during instruction. Deep understanding of some mathematical concepts is countered by superficial understanding of some other ideas. At least one idea may be presented in depth and its significance grasped by some (10%-20%) students, but in general the focus is not sustained.	Knowledge is relatively deep because the students provide information, arguments, or reasoning that demonstrates the complexity of one or more ideas. The teacher structures the lesson so that many students (20%-50%) do at least one of the following: • sustain a focus on a significant topic for a period of time; • demonstrate their understanding of the problematic nature of information and/or ideas; • demonstrate understanding by arriving at a reasoned, supported conclusion; • explain how they solved a relatively complex problem.	Knowledge is very deep because the teacher successfully structures the lesson so that most students (50%-90%) do at least one of the following: • sustain a focus on a significant topic; • demonstrate their understanding of the problematic nature of information or ideas; • demonstrate complex understanding by arriving at a reasoned, supported conclusion; • explain how they solved a complex problem. In general, students' reasoning, explanations, and arguments demonstrate fullness and complexity of understanding.

Adapted from National Center for Research in Mathematics Education. (1992). Wisconsin Center for Educational Research. Madison, WI: University of Wisconsin-Madison. Also adapted from Aguirre & Zavala (2013) CEMELA (2007), Kitchen (2005) and Turner, Drake, Roth McDuffie, Aguirre, Bartell, & Foote (2012). Aguirre, Turner, Bartell, Drake, Foote & McDuffie (2012). Please cite: TEACH MATH (2012) Culturally Responsive Mathematics Teaching Lesson Analysis Tool. Unpublished Instrument.

Rating / Category		1	2	3	4	5
3) Mathematical Discourse & Communication	***Guiding Question:* How does my lesson create opportunities to discuss mathematics in meaningful and rigorous ways (e.g. debate math ideas/solution strategies, use math terminology, develop explanations, communicate reasoning, and/or make generalizations)?**					
		Virtually no features of mathematical discourse and communication occur, or what occurs is of a fill-in-the-blank nature.	Sharing and the development of collective understanding among a few students (or between a single student and the teacher) occur briefly.	There is at least one sustained episode of sharing and developing collective understanding about mathematics that involves: (a) a small group of students or (b) a small group of students and the teacher. OR brief episodes of sharing and developing collective understandings occur sporadically throughout the lesson.	There are many sustained episodes of sharing and developing collective understandings about mathematics in which many students (20%-50%) participate.	The creation and maintenance of collective understandings permeates the entire lesson. This could include the use of a common terminology and the careful negotiation of meanings. Most students (50%-90%) participate.
4) Power and Participation	***Guiding Question: How does my lesson distribute math knowledge authority, value student math contributions, and address status differences among students?***					
		The authority of math knowledge exclusively resides with the teacher. Mathematical contributions in lesson are almost exclusively from the teacher. Teacher has final word about correct answers/solutions. Student mathematical contributions are minimal. Status differences among students are evident.	The authority of mathematics knowledge primarily resides with the teacher and a few students. Teacher calls on/involves a few students. Their mathematical contributions by students are valued and respected. Student involvement is from a particular subgroup (gender, language, ethnicity, class, disability). Status differences among students remain intact and unaddressed.	The authority of math knowledge between teacher and students is **sporadically** shared. At least one instance where the teacher calls on several students so that multiple mathematical contributions are accepted and valued. Teacher elicits some substantive math contributions. At least 1 strategy to minimize status differences among students (and specific subgroups) is evident.	The authority of math knowledge is shared between teacher and students. Multiple forms of student mathematical contributions are encouraged and valued. Teacher and students elicit substantive mathematics contributions. Some strategies to minimize status differences among students (and specific subgroups) throughout the lesson are evident.	The authority of math knowledge is **widely** shared between teacher and students. All mathematical contributions are valued and respected. Student mathematical contributions are actively elicited by teacher and among students. Multiple strategies to minimize status among students (and specific subgroups) are explicit and widespread throughout the lesson.

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5) Academic Language Support for ELLs	***Guiding Question: How does my lesson provide academic language support for English Language Learners?***					
		No evidence of a language scaffolding strategy for ELLs. Students who are not yet fully proficient in English are ignored and/or seated apart from their classmates.	Although there is no explicit use of language strategies for ELLs, students' use of L1 is tolerated. Focus on correct usage of English vocabulary.	There is at least one instance in which a language scaffolding strategy is used to develop academic language (i.e., revoicing; use of cognates; translated tasks/text; use of graphic organizers; strategic grouping with bilingual students).	Sustained use of at least a couple of language strategies, such as the use of revoicing and attention to cognates, direct modeling of vocabulary, use of realia, strategic grouping of bilingual students or encouragement of L1 usage is observed at least between teacher and one, or small group, of students.	Deliberate and continuous use of language strategies, such as gesturing, use of objects (realia), use of cognates, revoicing, graphic organizers and manipulatives are observed during whole class and /or small group instruction and discussions. The main focus is the development of mathematical discourse and meaning making, not students' production of "correct" English.
6a) Funds of Knowledge/Culture/Community	***Guiding Question: How does my lesson help students connect mathematics with relevant/authentic situations in their lives?***					
		No evidence of connecting to students' cultural funds of knowledge (parental/community knowledge, student interest). Lesson incorporates culturally neutral contexts that "all students" will be interested in.	There is at least one instance in connecting math lesson to community/cultural knowledge and experience. Lesson draws on student knowledge and experience. Focus is with one student or a small group of students.	There is at least one sustained episode of sharing and developing collective understanding about mathematics that involves connecting to community/cultural knowledge. Or, brief episodes of sharing and developing collective understandings occur sporadically throughout the lesson.	There are many sustained episodes of sharing and developing collective understandings about mathematics that involves connecting to cultural/community knowledge (e.g. student experiences are mathematized, student/parent connections with math work; math examples are embedded in local community/cultural contexts and activities – i.e. games).	The creation and maintenance of collective understandings about mathematics that involves intricate connections to community/cultural knowledge and permeates the entire lesson. This would include hook/intro, main activities, assessment, closure and homework. Students are asked to analyze the mathematics within the community context and how the mathematics helps them understand that context.
6b) USE of critical knowledge/social justice Support	***Guiding Question: How does my lesson support students' use of mathematics to understand, critique, and change an important equity or social justice issue in their lives?***					
		No evidence of connection to critical knowledge (socio-political contexts, issues that concern students)	Opportunity to critically mathematize a situation went unacknowledged or unaddressed when present.	There is at least one instance of connecting mathematics to analyze a sociopolitical/cultural context.	There is at least one major activity in which students collectively engage in mathematical analysis within a sociopolitical/authentic or problem-posing context. Mathematical arguments are provided to solve the problems. Pathways to change/transform the situation are briefly addressed.	Deliberate and continuous used of mathematics as an analytical tool to understand an issue/context, formulate mathematically-based arguments to address the issues and provide substantive pathways to change/transform the issue.

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