The Development of Texas Master Mathematics Teachers through the Rice University Mathematics Leadership Institute (MLI)

**2009 Math and Science Partnership (MSP)
Learning Network Conference**

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Session Outline

- Overview of MLI

- Texas Master Mathematics Teacher (MMT) certification process

- Impact of MMT

- Sample MMT exam items

- Discussion

MLI Goals

- Develop a cadre of lead teachers in mathematics

- Provide mathematics content and pedagogical support

- Develop highly-qualified mathematics teachers

- Ensure that *all* high school students have access to challenging mathematics courses

- Impact the instructional practices of mathematics faculty, post-docs, and graduate students

The Texas Master Mathematics Teacher Examination

- Overview
- Mathematics
- Pedagogy
- Leadership

Steps Required to Obtain Texas Master Mathematics Teacher Status

- Three years of exemplary teaching
- Coursework through an approved provider
- Successfully pass rigorous examination on mathematics content, pedagogy, and leadership

Impact on Lead Teachers with Texas Master Mathematics Teacher Status

- District-wide recognition
- Increased self-efficacy
- Increased mathematical content knowledge
- Increased pedagogical content knowledge
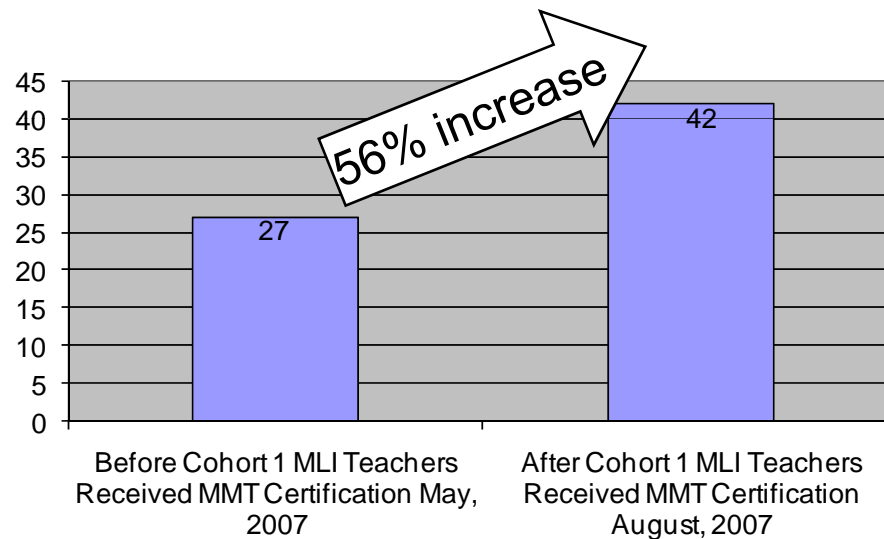- Career promotions
- Financial gain

Impact of MLI Master Mathematics Teachers on Their School Districts

- Increased pool of exemplary teachers
- Better prepared school-based mentors
- Increased district-level instructional support

Impact of Cohort 1 MLI Master Mathematics Teachers on Texas

Raising the Number of Master Mathematics (8 - 12) Teacher (MMT) Certifications across Texas

56% increase

	Before Cohort 1 MLI Teachers Received MMT Certification May, 2007	After Cohort 1 MLI Teachers Received MMT Certification August, 2007
	27	42

Aldine ISD has 6 and Houston ISD has 9 MMTs, all of whom earned the credential through MLI.

2008-2009 MMT Class

- From the original 28 Cohort 2 MLI Lead Teachers who participated in their first academic year in 2008-2009, 14 out of the remaining 21 (67%), are currently preparing for the MMT examination.

- One Cohort 1 teacher is also preparing for the MMT with this group.

Sample Exam Items

- Mathematics
- Pedagogy
- Leadership
- Case Study

MLI Information and Contacts

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An object placed in a tank of water for 24 hours has a temperature modeled by $H(t) = t(t + 2)(t - 15)(t - 30)$, where t is the number of hours in the tank. At what times, t, is the temperature of the object equal to zero?

A. −2, 0, 15, and 30

B. 0, 15, and 30

C. 15 and 30

D. 0 and 15

Use the information below to answer the question that follows.

Number of Items Produced	Revenue (in dollars)
2	76
4	144
5	175
10	300
14	364
20	400

Students are told that the revenue of a firm, values of which are given above, is a function of the form $y = ax^2 + bx$. What is the value of b?

A.   36

B.   38

C.   40

D.   42

Use the dialogue below to answer the question that follows.

Teacher:	Can you express sin(x + y) as the sum of two terms?
Student:	Yes, I get sin x + sin y.
Teacher:	How did you get your answer?
Student:	I used the distributive property.

Which of the following assignments would most effectively enable the student to realize that he is incorrect?

A. Graph sin x, sin y, and sin(x + y) on the same Cartesian coordinate system.

B. Determine the equivalence of sin(x + y) and sin x + sin y for $x = \frac{\pi}{2}$ and $y = \pi$.

C. Prove that the distributive property can only be applied to a nontrigonometric function.

D. Show that sin(x + y) = sin x cos y + sin y cos x for any values of x and y.

A new, schoolwide plan for improving mathematics instruction has been introduced at a local high school. The school principal asks the Master Mathematics Teacher to assess the ability of the school's mathematics teachers to meet the new instructional standards. The Master Mathematics Teacher determines that many of the teachers require further knowledge and skills in order to teach to the new standards effectively. Which of the following would be the most appropriate action for the Master Mathematics Teacher to take at this point?

A.   Survey teachers informally to determine whether they are interested in improving their knowledge and teaching skills.

B.   Ask teachers who possess the necessary knowledge and skills to suggest methods for assisting other teachers to implement the new methods.

C.   Revise the proposed instructional changes to a level consistent with the general knowledge and skills of the teachers.

D.   Meet with the principal to discuss providing professional development to equip teachers with the necessary knowledge and skills.

A Master Mathematics Teacher observes a class in which the teacher introduces graphing concepts using mathematical terms with which many students are not familiar. As the class progresses, the students begin to talk among themselves and show a general lack of interest. The Master Mathematics Teacher recognizes that these students would benefit if the teacher initially used contextual language and then gradually transitioned into using mathematical terms. Which of the following is the best way for the Master Mathematics Teacher to make the classroom teacher aware of this need?

A.   Describe the students' behavior and ask the teacher reflective questions about its possible causes.

B.   Tell the teacher to introduce the graphing unit with a vocabulary session and provide students with copies of definitions of key mathematical terms.

C.   Give the teacher a list of terms students may not have understood and suggest using alternative terms.

D.   Provide the teacher with copies of research studies on the value of using real-life examples and everyday language for teaching graphing.

Classroom Context: This case study focuses on a ninth-grade mathematics teacher, Ms. Balmos, who is instructing her algebra students on a "new" kind of function—the exponential function. The class, which meets for 90 minutes every other day, is composed of students who achieve at various levels.

Master Mathematics Teacher Task: Ms. Balmos has asked the Master Mathematics Teacher (MMT) to observe her class and provide assistance teaching an introductory lesson on exponential functions. The MMT has agreed to observe her lesson. Ms. Balmos shows the MMT a lesson plan that she intends to use on the day of the MMT's observation. On the following pages, you will find:

- information from Ms. Balmos regarding previous instruction for this class;
- the lesson plan implemented on the day of the MMT's observation;
- an assignment given by Ms. Balmos to her class;
- excerpts of notes taken by the MMT while observing Ms. Balmos's lesson; and
- representative samples of student work from the class.

Using these materials, write a response in which you apply your knowledge of mathematics, mathematics instruction, and mentoring to analyze this case study. Your response should include the following information:

- An analysis of two significant weaknesses in the effectiveness of the lesson on exponential functions. Cite evidence from the case study to support your observations.

- A full description of two instructional strategies or assignments that would be effective for Ms. Balmos to use to address the weaknesses you have identified. Be sure to describe one strategy or assignment for each of the weaknesses you identified.

- An explanation of why each of the strategies or assignments you have described would be effective in improving Ms. Balmos's instruction of exponential functions.

- A full description of two appropriate actions you would take as a mentor teacher to help Ms. Balmos implement the strategies or assignments you have described.